

Board Move Protects GD Stockholders If Takeover Proposed

The Board of Directors of General Dynamics Corporation on Feb. 1st declared a dividend distribution of one Preferred Share Purchase Right on each outstanding share of General Dynamics common stock. The Rights are designed to assure that all of the company's stockholders receive fair and equal treatment in the event of any proposed takeover of the company and to guard against partial tender offers, squeeze-outs, open market accumulations and other abusive tactics to gain control of General Dynamics without paying all stockholders a control premium.

The Rights will be exercisable only if a person or group acquires 20 percent or more of the company's common stock or announces a tender offer, the consummation of which would result in ownership by a person or a group of 20 percent or more of the common stock. Each Right will entitle stockholders to buy one-hundredth of a share of a new series of junior participating preferred stock at an exercise price of \$180.00.

If General Dynamics is acquired in a merger or other business combination transaction, each Right will entitle its holder to purchase, at the Right's then-current price, a number of the acquiring company's common shares having

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Space Systems Wins NASA Study Award For Future Travel

Space Systems Division has been selected for negotiations leading to the award of a \$5.5 million, three-year study of future space transportation systems.

The project, called the Space Transportation Infrastructure Study, is administered by the National Aeronautics and Space Administration's Marshall Space Flight Center in Huntsville, Ala.

The project's goal is to identify future space transportation systems to supplement the Space Shuttle and expendable launch vehicles and to identify promising technologies to reach these objectives.

"This important win provides us with the opportunity to become an integral part of NASA's planning process and to identify requirements that will influence the evolution of nearly all of Space Systems Division's products," said Dr. Alan M. Lovelace, Vice President and Space Systems General Manager.

Interrelationships to be examined in the study include those among several elements of the National Space Transportation System (NSTS), including the Space Shuttle, Space Shuttle Liquid Rocket Booster, Shuttle C, the General Dynamics' Centaur upper stage and future Space Transfer Vehicle stages, and non-NSTS elements such as expendable launch vehicles and the proposed Advanced Launch System.

Space Systems will develop recommendations for an integrated transportation approach that will make the best use of available and planned national space transportation resources.

The study will cover the entire spectrum of space transportation needs ranging from assembly of Space Station Freedom in the next decade to support of manned missions to the moon and visits to Mars early in the next century.

Both manned and unmanned Earth-based launch vehicles; vehicles used in space for shuttling personnel and cargo between Earth, the moon and Mars; and orbiting servicing facilities for maintenance and refueling of these vehicles in space will be covered by the study.

The company will staff the study with space transportation experts at both its San Diego facility and its Huntsville Engineering Field Office.

Eight companies, including General Dynamics, competed for the Space Transportation Infrastructure Study.



F-16 Aggressor Sports Paint Scheme Similar to Soviet MiG-29

Fighting Falcon Assumes U.S. Air Force Role As Aggressor Aircraft in MiG Colors By Joe Stout

The Fort Worth-built Fighting Falcon has begun serving the U.S. Air Force in yet another new role, that of aggressor aircraft simulating the latest Soviet fighters.

F-16s in MiG markings will be flown against other Air Force and NATO fighters in training exercises launched from Nellis AFB, Nev.; RAF Bentwaters, England; Kadena Air Base, Japan; and Tyndall AFB, Fla.

The first F-16 aggressors will be used at Nellis in Red Flag operations and the training of tactical Air Force units based in the western United States. The other aggressor squadrons will support training in their respective geographical regions.

Nellis and RAF Bentwaters are receiving their aircraft early this year, with Kadena and Tyndall scheduled to follow next year.

The F-16 began similar operations in 1987 as the U.S. Navy's advanced adversary fighter. Instructor pilots of the Navy Fighter Weapons School (Top Gun) and three adversary squadrons are using 26 F-16Ns to "fight the fleet" in mock dogfights.

All the Air Force aggressors will be fully combatcapable. The units at Nellis, Bentwaters and Kadena will fly F-16C/Ds, while Tyndall is scheduled to receive F-16A/B aircraft. The F-16 aggressors are being furnished

and supported out of the existing Air Force inventory due to budget constraints.

The aggressors are identical to F-l6s flown by operational fighter squadrons, except for their Soviet-style paint schemes. Markings based on the blue and gray MiG-29 Fulcrum and the brown, tan and green MiG-23 Flogger will help distinguish the aggressors from "friendly" F-l6s flown in the same training exercises.

The Air Force is replacing its current F-5 aggressors because of structural problems arising from their frequent high-g usage. The F-5 also lacks the systems and flight performance needed to replicate the capabilities of modern Soviet fighters.

The F-16 was chosen as the new aggressor because of its high performance and supportability. The Navy likewise chose the F-16N as its adversary aircraft because of the Fighting Falcon's capability to simulate "fourth generation" fighters like the Su-27 Flanker and MiG-29 Fulcrum, plus future threat fighters still under development.

Other dedicated roles of the worldwide F-16 fleet include air-to-air, air-to-surface, strategic air defense, radar suppression, reconnaissance, experimental testing and flight demonstration.



USS Pasadena, Electric Boat's 24th SSN 688 Submarine, Is Commissioned at Groton, Conn.

Submarine Pasadena Is Commissioned By Graham Gavert

The USS *Pasadena* officially joined the fleet Feb. 11th with the accolade as the most capable attack submarine in the world.

Pasadena, the 24th 688-class submarine delivered to the U.S. Navy by Electric Boat, was commissioned in ceremonies at the Naval Submarine Base at Groton, Conn.

Adm. Carlisle A. H. Trost, Chief of Naval Operations and the principal speaker, called *Pasadena* "not just the newest but the most capable attack submarine in the world . . . able to operate to advantage in any environment against any system that can be deployed against her."

He added that the vessel joins a "submarine force at full strength, operating with full professionalism."

The theme of excellence was emphasized by many of the day's speakers. Vice Adm. Roger F. Bacon, Commander Submarine Force, U.S. Atlantic Fleet, said the submarine force remains our nation's principal deterrent to war and therefore the principal means to ensure peace. "The deterrent aspects of mobility, stealth, firepower, reliability and survivability," he said, "are summed up in this ship's motto, 'Anytime, Anywhere.' "He said that *Pasadena* must be viewed as "a total platform, with all capabilities, not the least of which is people. *Pasadena*'s high-tech capabilities of deep submergence, nuclear propulsion and sophisticated combat systems require the very finest crew that . . . the country can assemble."

Pasadena (SSN 752), which was launched on Sept. 12, 1987, is the second submarine of its class to feature a number of improvements. A new integrated combat and sonar system that can track enemy submarines and

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Board Move Protects GD Stockholders If Takeover Proposed

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a market value at the time of twice the Right's exercise price. In addition, if a person or group acquires 20 percent or more of the company's outstanding common stock, otherwise than pursuant to a cash tender offer for all shares in which such person or group increases its stake from below 20 percent to 80 percent or more of the outstanding shares of common stock, each Right will entitle its holder (other than such person or members of such group) to purchase, at the Right's then-current exercise price, a number of the company's common shares having a market value of twice the Right's exercise price.

Following the acquisition by a person or group of beneficial ownership of 20 percent or more of the company's common stock and prior to an acquisition of 50 percent or more of the common stock, the Board of Directors may exchange the Rights (other than Rights owned by such person or group), in whole or in part, at an exchange ratio of one share of common stock (or one one-hundredth of a share of the new series of junior participating preferred stock) per Right.

Prior to the acquisition by a person or group of beneficial ownership of 20 percent or more of the company's common stock, the Rights are redeemable for one cent per Right at the option of the Board of Directors.

The Rights Plan also contains provisions that permit a bidder to call for a stockholders' meeting to vote to redeem the Rights upon compliance with certain procedures when a fair cash offer is made for all the company's shares.

The Board of Directors is also authorized to reduce the 20 percent thresholds referred to above to not less than 10 percent.

The Rights are intended to enable all General Dynamics stockholders to realize the long-term value of their investment in the Company. They will not prevent a takeover, but should encourage anyone seeking to acquire the company to negotiate with the Board prior to attempting a takeover. Neither the ownership nor the further acquisition of the company's securities by the Crown family and certain related interests will cause the Rights to be exercisable or nonredeemable or trigger the other features of the Rights.

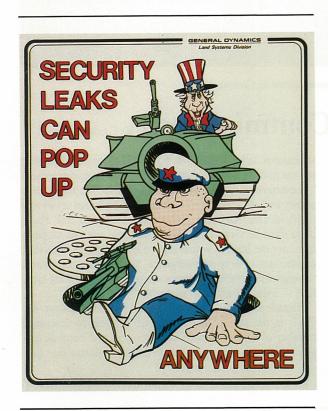
The dividend distribution was made on Feb. 13th, payable to stockholders of record on that date. The Rights will expire on Feb. 13, 1999. The Rights distribution is not taxable to stockholders.

Cafeteria Dedicated At Camden Facility

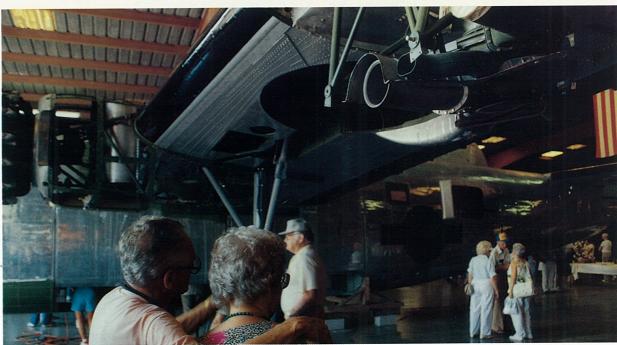
Pomona Camden employees dedicated a new dining facility at a Grand Opening recently.

The food service area at Camden Operations includes nearly 1,500 feet of food preparation and service area. It was completely renovated and a new kitchen installed. Thirteen new food service employees have been hired to staff the facility for food preparation, service and cleanup.

Jeff Whitby, formerly of the Little Rock (Ark.) Excelsior Hotel, has been named food service manager.







Liberator on View. A World War II B-24J Liberator being restored to full flying capability is viewed by the public for the first time at an open house in its hangar at Kissimmee, Fla. The restoration, which is about 80 percent complete, is being aided by a grant from General Dynamics. Consolidated Aircraft Company, starting in 1939, built almost 10,000 Liberators at its San Diego and Fort Worth plants. The B-24J above was built at the Fort Worth plant in 1944, first flew for the British Coastal Command and then saw action against the Japanese in India. It has not been flown in more than 30 years. Tom Reilly Vintage Aircraft, Inc., which is doing the restoration work for the Collings Foundation, hopes to have the B-24J ready for participation in the B-24 reunions at Fort Worth in May and San Diego in September. Employees wishing to make tax deductible donations to the project can send their contributions to: Collings Foundation, Box 248, Stow, Mass., 01775.

Submarine USS Pasadena Is Commissioned

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weapons through a single computer system has been installed. The fairwater planes have been replaced by retractable bow planes located beneath the water's surface, increasing the submarine's maneuverability. And the vessel's sail has been hardened with stronger materials to allow the submarine to break through ice when on Arctic operations.

Praise was extended during the ceremony to the employees of Electric Boat for their talent and skills. James E. Turner Jr., Vice President and Electric Boat General Manager, said that in the construction and testing of *Pasadena*, Electric Boat's "team of people has had a significant share of the responsibility for making this submarine ready for this milestone."

Rear Adm. John S. Claman, who until recently was Supervisor of Shipbuilding in Groton and who represented the Naval Sea Systems Command, remarked on the appropriateness of a commissioning in the middle of winter. "Pasadena has been imbued with war fighting character-

istics to take the sea fight to the backyard of our adversaries, the Arctic," he said. "Our oceans are our protector and our shield . . . a natural barrier to keep enemies away, but only if we possess the superior warships embodied in *Pasadena*, warships that can rid the oceans of a potential threat."

Adm. Claman, who had overseen most of the construction of *Pasadena* while serving as Supervisor of Shipbuilding, said the submarine represents the best that American technology and industry can build. "The men and women of Electric Boat, SupShips Groton, the Naval Sea Systems Command and various contractors have combined the unique talents of worker, designer, engineer and manager, to build and deliver a magnificent and purposeful ship."

Among the guests at the ceremony were Mrs. Pauline Louise Trost, the ship's sponsor; James R. Mellor, Executive Vice President-Marine, Land Systems and International; and a group of veterans from the light cruiser *Pasadena* (CL-65), commissioned 45 years ago in June of 1944

Pomona Engineer Gets 'Breakthrough Award'

Kris Gossian, a Pomona senior design and construction engineer, has been presented the division's first "Breakthrough Award" by Sterling V. Starr, Vice President and Pomona General Manager.

The award was established to recognize individual employees who, by their own innovation and determination, perform a service or action that creates a breakthrough with dramatic positive impact on the division well into the future.

Gossian designed and supervised the construction of a unique thermal storage system for cooling new production composite presses. The system has saved thousands in utility costs and qualified for significant energy rebates from the local electric company.

Thermal storage involves forming ice on the surface of evaporator tubes and storing it in an insulated tank until chilled water is needed for cooling purposes. Then a pump circulates cold water from the ice storage and returns the warm water to the tank for re-cooling by the melting ice. By forming the ice at night, the thermal system takes advantage of the lower, off-peak power costs.

The Southern California Edison Company said the daytime, on-peak demand charge is 16.7 percent higher than nighttime, off-peak charges.

Convair Recreation Association Has Served Well for 40 Years By Julie C. Andrews

The General Dynamics Convair Recreation Association (CRA) celebrated its 40th birthday in January. Over the years, thousands of Convair, Space Systems, Electronics and Data Systems employees in San Diego have visited its facilities to celebrate company milestones, say goodbye to retiring coworkers, give their kids a train or merry-goround ride, play a sport or pursue a hobby.

"CRA has received national recognition as one of the leading recreational organizations in American industry," said Brian J. Stevens, CRA Administrator. "CRA is unique in that it is an association completely financed and controlled by the employees."

It is also unique in that the original facilities were built entirely by employee volunteers. The facilities now include the 19,000 square-foot clubhouse and the 27-acre Missile Park with lighted tennis courts, athletic fields, a jogging track, snack bar and play equipment.

The nonprofit CRA gets its income from all in-plant vending machine profits. While Stevens and his staff manage the daily CRA business and administration, the governing of the association is up to the volunteer Employee Council made up of club commissioners and representatives, committee members and past and present officers representing all four San Diego divisions.

Charles M. Ogle, Manufacturing Development Technician in Convair's Plastics Lab, has been a CRA Commissioner for more than 30 years and remembers how entire families would come out on weekends as construction of the original facilities began.

"Missile Park was built between 1958 and 1965," said Ogle. "When the Kearny Mesa plant was built, the contractor left behind two construction buildings. We joined them with an auditorium, and that became the clubhouse. Every tree in the park was planted by employee volunteers. Even the miniature railroad that runs around the perimeter of the park was designed and built entirely by employees."

Later, the association purchased a merry-go-round from a traveling circus. Every Easter the CRA celebrates the springtime opening of the park with an Easter egg hunt and the resumption of train and carousel rides.

Missile Park gets its name from the Atlas missile that stands at the entrance to the facility.

William P. Shine, Electronics Manager of Engineering Personnel, headed up the team of employee volunteers in charge of erecting the Atlas display missile, given to Convair in 1962. Convair had provided technical assistance for five other Atlas displays, including the one on display at the Smithsonian and at Kennedy Space Center.

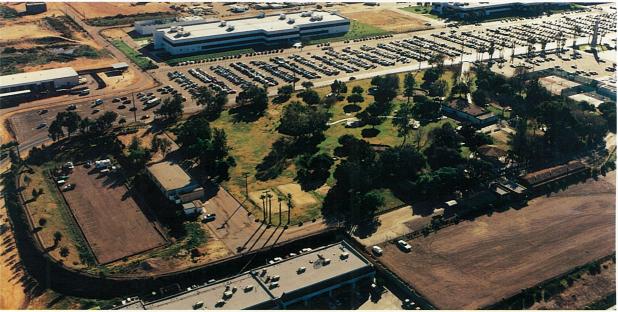
"We took a certain pride in being able to put the Atlas up in our own backyard after having put it on display in so many other places," Shine said.

As the concern with fitness has continued to grow throughout the '70s and '80s, CRA's Health Fitness Center has expanded to meet the needs of its members with exercise facilities and structured programs. With the help

and guidance of the HFC staff, company employees have lost weight, shaped up, lowered blood pressure, quit smoking and examined ways to balance all the factors that lead to a healthy lifestyle.

CRA's ministore offers a variety of items, including discount tickets to area amusements, vitamins, photo finishing and gift items. CRA Travel offers travel services to employees at discount rates.

"I think that every single employee visits CRA for one reason or another during the year, whether it's a one-time customer who picks up some movie tickets before the weekend or the heavy user who belongs to three clubs, plays softball and jogs," said Stevens. "Everybody gets something out of CRA, even if it is just the pride in knowing it's there."



Aerial view of Missile Park and CRA Facilities with Portions of the Kearny Mesa Plant in Background

Pace Says Cost Reduction Program Is Reflected in 4th Quarter Earnings

Chairman and Chief Executive Officer Stanley C. Pace reported that improvements in the company's net earnings for the fourth quarter of 1988 were due in part to the cost reduction program.

The company announced Jan. 30th that net earnings for the period were \$110.2 million, or \$2.64 per share, on sales of \$2.5 billion. Net earnings for the same period in 1987 were \$95.3 million, or \$2.27 per share, on sales of \$2.5 billion. Net earnings for the fourth quarter of 1988 include tax benefits of \$25 million, or 60 cents per share, from tax law changes resulting in reductions in deferred taxes. Similar benefits of \$20 million, or 48 cents per share, are included in the net earnings for the fourth quarter 1987

Funded backlog at the end of 1988 was \$18 billion and total backlog (funded and unfunded) was \$24.5 billion, representing approximately 2.6 years of sales. Comparable amounts at the same time last year were \$17 billion and \$22.8 billion, respectively.

Net earnings for 1988 were \$379 million, or \$9.03 per share compared to \$437.3 million, or \$10.26 per share in 1987. 1988 sales were \$9.6 billion compared to \$9.4 billion

in 1987. Net earnings include tax benefits of \$85 million, or \$2.03 per share, for 1988 and \$80 million, or \$1.88 per share, for 1987.

"Fourth quarter earnings for 1988 reflect the benefits of our cost reduction program," Pace said. "Both Cessna and Land Systems have shown significant improvements from reduced costs. The fourth quarter for Cessna is one of the strongest in recent history. With orders for over 100 jet aircraft received during the year, the future looks brighter also."

Manufacturing improvements at Land Systems, together with cost reductions, are increasing operating margins on the MI tank. Expenditures for the U.S. Air Force's Advanced Tactical Fighter continue to reduce operating earnings in the Military Aircraft line of business.

During the fourth quarter, a consortium of four European countries signed a licensing agreement to produce the Stinger Weapon System. "A royalty related to this licensing agreement increased fourth quarter operating earnings in the Missiles, Space and Electronic Systems line of business," Pace said. "This licensing agreement is typical of the growth potential available in the interna-

tional market."

Pace said an agreement has been signed on another important international program, the Japanese FS-X fighter aircraft. "It is important because it represents the first 'two-way street' exchange of technologies on such a major program between American and Japanese industries," Pace added. "The two governments have determined precisely which technologies we will release to the Japanese and which ones we will receive from them." The agreement assures General Dynamics and other U.S. firms between 35 percent and 45 percent of FS-X development.

General Dynamics recently was awarded the competitively bid construction contract for the first SSN 21-class (Seawolf) attack submarine. With this award, Electric Boat has won the lead-ship construction for 16 of the Navy's 19 classes of nuclear submarines. "This win gives us a decided head start on future construction contracts in competing for the remaining 29 ships the Navy plans to build," Pace said. "In addition, we were awarded a \$400 million contract during the fourth quarter for construction of one SSN 688-class attack submarine, our 33rd in this class."

Employees Win Awards

General Dynamics won five awards recently in the International Association of Business Communicators "Quest for the Best" competition sponsored by the IABC San Diego Chapter.

Awards of Achievement went to Suzanne Parlett of Convair and Jack Smothers of Space Systems for a desk calendar graphic design and text and to Parlett and John Laven of Convair for a promotional piece graphic design. Awards of Merit went to Richard Wilson and John Clinger of Space Systems for a security brochure and to Julie Andrews of Western Region Public Affairs for feature stories and articles.

General Dynamics received the highest number of awards of any single organization in the competition.

Pace Is Selected

Chairman and Chief Executive Officer Stanley C. Pace has been named Vice Chairman of the Board of Governors of the Aerospace Industries Association and will serve on the AIA's Executive Committee.



Performance Recognition. Maj. Gen. William S. Flynn, Commanding General, U.S. Army Tank-Automotive Command (left), signs a letter of intent at the Detroit Arsenal Tank Plant initiating a Contractor Performance Certification Program for the M1A1 Abrams main battle tank. Robert W. Truxell, Vice President and General Manager of Land Systems, watches Flynn. Truxell also signed the document. The program recognizes contractors who consistently deliver exceptionally high quality products to the Army and is intended to result in a reduction of on-site government inspectors. Land Systems is the first General Dynamics division to participate in the program.

Preparing for Second Survey Is Team Effort

(This is the first in a series of columns by Employee Survey Program Manager Sue L. Shike that will appear in General Dynamics World in the months before and after the September employee survey.)

As we prepare for our second employee survey, we have one big advantage over the last time: experience, since many of us have been through the cycle once. We



are collecting lessons learned from employees at all levels. Some of your suggestions were featured in a General Dynamics World article last October. Other recommendations have been collected by the division survey managers and are being used to help plan the 1989 survey.

For example, you suggested shortening the questionnaire, so we are cutting it almost in half. We also learned that the larger divisions and locations needed more than three weeks to administer the survey on company time, so five weeks are being allocated this year, starting in mid-September.

You also suggested more effective ways to handle the action planning phase, so changes in those processes are planned. For example, experience indicated that taking one or two action items at a time and scheduling the others was preferable to tackling everything at once.

Preparing for the next survey is a team effort. But to do this, the division survey managers and I want, and need, your help. Please send them or me your comments about the first survey process and any suggestions to improve the next cycle. Your questions about the survey process are welcome, too. We'll be happy to personally answer them. Those of interest to a large audience will be addressed in future columns in General Dynamics World.

The survey managers will meet March 7th and would like to incorporate your ideas into their planning. We encourage you to contact your local survey manager listed below.

We hope to hear from you soon . . . and often . . . throughout the months ahead.

Security means... Pride ... Strength ... Liberty

Charles A. Anderson **Heads County Drive** For United Way

Charles A. Anderson, Vice President and Fort Worth

As the leader of the county's largest charitable fund drive, Anderson will recruit volunteers from local industry to fill key positions in the 1989 campaign, which officially begins next September.



Klick highlighted a weeklong series of programs at Space Systems during the San Diego areawide Women's Opportunities Week. General Klick is Deputy Commander for Communications, Operations Support and Control Systems-Air Force Space Division with responsibility for all Air Force flying satellites, including those launched by Space Systems' Atlas launch vehicles.

General Manager, has been named general campaign chairman of the 1989 United Way drive in Tarrant County,

He has been a member of the local United Way Board of Directors since 1987 and led a business and industry group in the 1988 United Way drive.

Fort Worth employees pledged more than \$3.8 million in the division's 1988 Con-Trib Club Campaign, which supports the United Way and other charitable agencies.



Women's Opportunities Week. Brig. Gen. (Select) Jean E.

Division Survey Managers and Telephone Numbers

Division/Subsidiary	Location	Survey Manager	Phone Number
Cessna	Wichita Vandalia	Sharon K. Prophet Dorsey L. Long	316-946-7361 513-890-5246
Convair	San Diego	Barbara A. McDonald	619-573-9935
Corporate Office	St. Louis	Sue L. Shike	314-889-8458
Data Systems	St. Louis Fort Worth Norwich Pomona Rancho California San Diego	Dennis J. O'Rourke Carol F. Ozee David C. Carey Ellen L. Ploeger William J. Bockstahler Nannette M. Boulais	314-851-8987 817-737-1825 203-823-2409 714-868-2113 714-699-2702 619-573-3971
Electric Boat	Groton Quonset Point	Andrew J. DeLaura Timothy M. Crowley	203-446-5330 401-268-2505
Electronics	San Diego	M. (Ray) Reynante	619-573-5090
Fort Worth	Fort Worth Abilene	John L. Shultz Bruce R. Condit	817-777-1883 915-691-2022
Freeman United Coal	Chicago West Frankfort	James T. Ryan G. Robert Stewart	312-443-6910 618-932-2164
GD Services	St. Louis	Bernard M. Landau	314-851-4053
Land Systems	Sterling Heights	Karl G. Oskoian	313-825-7980
Material Service	Chicago	Edward K. Wilverding	312-443-6712
Pomona	Pomona Camden	Naomi M. Morales Donald C. Lee	714-868-2082 501-574-4131
Space Systems	San Diego	Lisa M. Lawrence	619-576-5710
Valley Systems	Rancho Cucamonga	Peggy T. Zimmerman	714-945-8208

Defense Systems Students Study Tomahawk

Convair's Tomahawk cruise missile factory area recently was transformed into a temporary college classroom. Fifteen students from the Program Management Course (PMC) at the Defense Systems Management College (DSMC) visited the plant as part of a case study of the Tomahawk program.

The 20-week PMC is the nucleus of the academic ogram at the DSMC, an institution founded in 1971 by then-Deputy Secretary of Defense David Packard to pro-



Case Study Visit. Jay Stroh, Convair Manager of All-Up Round Production (second from right), shows Tomahawk hardware to students from the Defense Systems Management College.

vide high-level defense acquisition management education to Department of Defense program managers.

Frank Thompson, Convair Division Vice President and Cruise Missile Program Director, was host to the students during their two-day visit.

Earlier, he had participated in a classroom discussion on Tomahawk at the college in Fort Belvoir, Va. The classroom study helped prepare the class for its "field trip' to the Convair production facility.

"By acting as host for these future program managers, we in industry help to foster an understanding of our capability to produce, our management issues and the role we play in fielding a major weapon system," Thompson

The Program Management Course is offered three times a year. While aimed at future military acquisition managers, it is also open to people from industry, other federal agencies and allied nations.

The case study complements classroom learning by allowing students to participate in an actual acquisition program and to experience the challenges faced by DOD program managers and their industrial counterparts. Groups of about 30 students are assigned a particular acquisition program.

While at Convair, the DSMC students toured the production areas, including the "paperless factory," the missile maintenance area and the automated warehouse and attended an intense, half-day session at the Tomahawk Weapon Facility at the Sycamore Canyon Test Site north of San Diego.

Telecast Sponsored

In observance of National Quality Month, Data Systems Division-Western Center invited representatives from the San Diego divisions and more than 75 businesses and government agencies in San Diego to the National Quality Forum Teleconference recently. The three-hour forum included executives of some of America's top corporations whose remarks centered on the theme, "Quality: Beyond Customer Satisfaction." The forum originated in New York City and was broadcast nationally. This is the second year DSD-WC has sponsored the telecast.

Monthly SSIP Chart Informs Employees Of Their Investments

How is your investment in the General Dynamics Savings and Stock Investment Plan (SSIP) doing? The accompanying chart, which appears in each issue of *General Dynamics World*, allows hourly and salaried employees to review at a glance the progress of their investments in the plan.

The investment performance of Government Bonds, Diversified Portfolio and Fixed Income funds are shown as percentage increases or decreases over the past three years.

For instance, in December 1988, employee investments in the Salaried Plan Fixed Income Fund earned 10.7 percent over what they were in December 1987, which was 11.4 percent over what they were in December 1986. In other words if an employee invested \$100 in the Fixed Income Fund by December 1986, the fund would have been worth \$111.40 a year later. By December 1988, the fund was worth \$123.32.

The percentage increase for the funds covers a full year, not just one month. Funds in the plan a full 12 months earn an annual rate of return at these levels. The October 1987 stock market crash is reflected in the tables and has made a considerable impact on the performance of the Funds.

"The stock market crash substantially affected the performance of certain funds, particularly the Diversified Portfolio Fund," said John C. Palazzolo, Corporate Manager—Employee Benefits, SSIP & Government Reporting. "As long as October 1987 was included as one of the months in the 12-month cycle, a significant fluctuation in the percentages will appear for the Diversified Portfolio Fund on the chart."

Investments in the General Dynamics Common Stock Fund are listed at the market value per share on the last trade date of the month.

If you have any further questions, contact your local Employee Benefits office.

Savings and Stock Investment Plans Annual Rate of Return for the 12 Month Period Ending: Dec. Dec. Dec. 1987 1988 1986 Salaried Government Bonds 10.4% 5.8% 7.1% Diversified Portfolio 22.5% 6.7% 15.2% 10.7% Fixed Income 12.0% 11.4% Hourly Government Bonds 10.0% 5.9% 7.3% 23.1% 7.3% 15.5% Diversified Portfolio 11.4% 10.6% GD Stock Closing Price \$67.75 \$48.75 \$50.75

Office Complex Wins Award

The Land Systems Central Office Complex in Sterling Heights, Mich., recently won an Outstanding Engineering Achievement award from the Michigan Society of Professional Engineers.

Fort Worth Donates Food

Fort Worth employees have donated 16,000 pounds of canned food to the Tarrant County Food Bank. Local service agencies distributed the food to the needy in the area.

World

Published by: General Dynamics Corporation Pierre Laclede Center, St. Louis, Mo. 63105

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Videoconferencing Facility. Travis Harp, Fort Worth's F-16 Coproduction Manager-Turkey (left, seated), discusses meeting objectives with videoconference coordinator Cheryl Wright and John H. Birdwell, Manager of Production Management-Turkey (standing), in the division's new videoconferencing room. Video images displayed in the room are projected simultaneously in a similar facility at TAI in Turkey during weekly conferences.

Teleconferencing Provides a High-Tech Link In the Fort Worth-Turkey F-16 Program By Joe Stout

Groups of employees at Fort Worth and TUSAS AEROSPACE INDUSTRIES, INC. (TAI) in Murted, Turkey, have been getting together regularly to discuss issues related to TAI's production of F-16s for the Turkish Air Force

They've been doing it without travel, thanks to the hightech capabilities of General Dynamics' video network. Weekly teleconferences have contributed to TAI's record of delivering all aircraft on or ahead of schedule, said Travis Harp, Fort Worth's Coproduction Manager for the Turkish program.

"We've found that teleconferencing is a very useful tool to resolve important issues and head off potential problems," he said. "We can literally sit down with an engineering drawing, put the drawing up on the screens in both Fort Worth and Turkey, and make notations on it as necessary to explain a problem or solution."

"Instead of talking about things over the phone in a one-on-one situation, we can bring in experts or decisionmakers as required," he said. "Problems that formerly took weeks to resolve can now be worked out in minutes."

The link between Turkey and Fort Worth was approved by the U.S. Air Force as a way to cut travel costs and enhance the efficiency of the Turkish F-16 program, he said.

Shelly J. Russell, Fort Worth's Videoconference Administrator, explained that freeze-frame video technology allows video images of documents to be recorded in either

location and transmitted to the other, for disk storage, before and during a meeting. The documents are then projected on screens in both locations and annotated in real time during the meeting.

The teleconferences are cost-effective, with all necessary communications accomplished over regular telephone circuits, Russell said.

Russell trained TAI's videoconferencing operators in Turkey last fall. The TAI videoconferencing center also can be linked with compatible equipment at most of General Dynamics' major U.S. facilities and at the F-16 System Program Office at Wright-Patterson AFB, Ohio.

"The only thing we won't be able to synchronize is the time of day," Russell said. Due to an eight-hour time zone difference, the meetings between Fort Worth and Turkey are held at the start of the workday in Texas and at the end of the day in Turkey.

Fort Worth's videoconferencing center also allows for meetings between the division and other companies joined in contractor teaming arrangements with General Dynamics. Teleconferencing is also used routinely in meetings among the company's various divisions and with the Corporate Office, Russell said.

The next step in the company's videoconferencing network will be the advent of full-motion video transmission, allowing participants on both ends of a conference to actually see each other and show graphics and items as they talk.



Belgian F-16 Anniversary. Maj. Gen. Piet van Hecke, Deputy Chief of Staff for Operations and Training of the Belgian Air Force, speaks at ceremony held Jan. 26th to commemorate the Belgian Air Force's 10th anniversary of F-16 operations. The event was held in a hangar at Beauvechain Air Base. Belgium has received 130 Fighting Falcons.

Computers Listen to Whale Language, Then Enemy Helicopters By Julie C. Andrews

To the human ear, the underwater sounds of whales from Alaska or from Norway may seem the same. Electronics Division computer scientists have developed neural network computing applications that can differentiate the sounds.

Now they are studying how the same application can analyze battlefield sounds to improve surveillance. Their goal is to develop a system that will allow a tank commander to identify the sound of an approaching helicopter as friend or foe.

"Current battlefield surveillance systems consist of large and small radars, or electro-optical or infrared sensors, most of which are ground-based," said Patrick K. Simpson, Principal Investigator for IRAD Projects in Electronics' Artificial Intelligence Center. "We envision a system of tank-mounted sensors and on-board computers using neural networks that can distinguish the sounds of enemy helicopters in the thick of battle."

In their study of the neural network computer's ability to recognize sound patterns, Electronics computer scientists used a series of tapes made in the field by Hubbs Marine Research Center of Sea World Research Institute. The tapes contained whale sounds recorded at four locations — Alaska, Norway, Iceland and Antarctica.

Once programmed with "whale language" from the different locations, the neural network was able to distinguish and classify the sounds according to their geographic location, even when mixed with extraneous noise.

"The neural network can identify the sound without having been previously programmed with every known pattern," said Russell O. Deich, also an IRAD Principal Investigator at Electronics. "You can present an example to the neural network and it will provide a response that is most closely associated from all known situations."

To accomplish this association, Electronics' researchers applied a mathematical theory known as fuzzy logic to neural networks. Fuzzy logic measures the degree to which something can be defined without having complete data.

This ability to reach decisions based on incomplete data is what distinguishes the neural network computing capa-



Sounds of Combat. Russell O. Deich (left) and Patrick K. Simpson demonstrate a type of directional microphone that will be used in preliminary field tests to capture battlefield sounds.

bility from conventional computers, which would have to be explicitly programmed.

Electronics computer scientists have used a similar neural network application to identify helicopter sounds from ground-based sensors under severely noisy conditions. The next step is to field test the system on a tank.

They propose mounting sensors on tanks in an arraylike fashion with each directional microphone aimed to cover a specific area. Subsystems remove other noise for cleaner signals.

The on-board computer produces the best match between the stored signal examples of enemy helicopters and the input signal. "Helicopters pose an ominous threat to any modern battlefield platform, especially tanks," Deich said. "Current technologies may not be able to identify a helicopter if it is hovering behind the cover of trees or below hilly terrain or if inclement weather is present. It is possible that future equipment could then detect the enemy helicopter by the sound it makes."

Electronics researchers contribute to the San Diego technical community's growing reputation as a national center for research in neural computing. The International Conference on Neural Networks has been held in San Diego for the last two years.

Fort Worth Sponsors Math and Science Symposium for Texas Teachers

The Superconducting Super Collider and barriers that discourage women from entering technical fields were among the timely topics discussed at the sixth annual Math and Science Teachers Symposium held recently at Fort Worth.

The division sponsored the event in cooperation with the local Alliance for Minorities in Engineering and the (Dallas/Fort Worth) Metroplex Alliance for Engineering Education. About 85 teachers attended the daylong series of workshops at Fort Worth's Human Resources Training Center

"The seminar is intended to help math and science teachers become more aware of how their subjects are applied today in industry," said Steve DeLeon, a Fort Worth engineer who worked with the division's Community Relations Department in organizing the event. "We try to give the teachers ammunition they can use to get their students excited about the fields of math and science."

The symposium included workshops led by Fort Worth employees and representatives of other companies, the National Weather Service, the Federal Aviation Administration and the U.S. Army Corps of Engineers.

Dr. Robert Tener of the North Texas Commission, a group of educational and industrial leaders formed to promote the Super Collider project, led one of the most popular sessions. Tener explained some of the technical aspects of the Super Collider and the positive effects the project is expected to have on Texas universities.

Fort Worth employees Caroline T. Rogers, Angie

Fort Worth employees Caroline T. Rogers, Angie Tavarez and Becky L. Wermeyer participated in a panel discussion on the role of women in engineering. "One of the issues we discussed was barriers," Tavarez said. "The panelists all talked about the stereotype that most women aren't suited for career fields related to math and science and what must be done to change it."

In another workshop, Fort Worth employees Wesley T. Beard and Jim M. Phillips presented examples relating secondary school math and science work to principles used in aircraft development.

Charles F. Herndon, Fort Worth's Director of Structure and Design, spoke about current engineering enrollment trends at U.S. universities. He expressed industry's concerns about decreasing enrollments and the adverse effect they could have on the nation's position in future world markets.

Herndon said long-term solutions should include better technical instruction at the elementary and secondary school levels and continued encouragement of prospective minority and female engineering students.

The Texas Education Agency has approved the Math and Science Teacher Symposium for advanced academic training credit toward advancement in its teaching career ladder program.

The symposium attendees were from many different school districts, including several in Ellis County, Texas, the planned location of the Super Collider.



Women in Engineering. Public school teachers listen as Fort Worth's Caroline Rogers discusses challenges faced by women who work in technical fields. Other panelists are (left to right) Fort Worth's Becky Wermeyer and Angie Tavarez, Debra Davis of R-TEC and moderator Sarah Staugler of LTV.

Contributions by Four San Diego Divisions Helped Area Charities In Topping Holiday Goals

Alarming headlines in the San Diego newspapers in the middle of December warned that charitable holiday drives were falling far short of what would be needed to make Christmas merry for the unfortunate.

Now that the final tallies have been made, the results show that San Diegans came through, helped in large part by the 16,000 employees of General Dynamics.

All four divisions participated in the citywide Holiday Food Drive, which had a goal of "88 Tons in 88." Com-

pany coordinators estimated that plantwide bins netted about five tons of food that became part of the 140 tons ultimately collected.

The Mr. Teddy Bear toy drive, another four-division effort, brought in 2,500 toys for the Hillcrest Receiving Home and Child Protection Center of Children's Hospital. This was 500 toys over the goal of Electronics Division's John "Mr. Teddy Bear" Kenney.

Many departments took on projects of their own. Paul

Bokros, Division Vice President-Operations for Electronics, reported that the Operations Department's Adopt-A-Family program adopted 17 needy families during the holidays and provided them with food, clothing and household items.

Convair's Contracts and Estimating department raised \$1,150 through December bake sales and gave the money to several needy families identified through the Employees' Con-Trib Club.

Air Force Reserve Group at Tinker AFB Converting to Fighting Falcons

The Air Force Reserve's 507th Tactical Fighter Group at Tinker AFB, Okla., celebrated its conversion from the F-4D to the F-16A Fighting Falcon during a recent ceremony attended by more than 1,500 Air Force personnel and Oklahoma dignitaries.

The unit's new Mission Statement was ceremoniously passed down by representatives of its various command levels, beginning with the Air Force's Tactical Air Command. The Mission Statement tasks the 507th with air interdiction, airfield attack, defense suppression and close air support.

Participants in the ceremony included Lt. Gen. Peter Kempf, Commander of the 12th Air Force; Maj. Gen. Roger P. Scheer, Chief of the Air Force Reserve; Brig. Gen. John J. Closner, Commander of the 10th Air Force; Maj. Gen. William P. Bowden, Oklahoma City Air Logistics Center Commander; and Brig. Gen. Forrest S. Winebarger, the 419th TFW Commander.

The Hon. Mickey Edwards, U.S. Representative from Oklahoma, was a featured speaker. He praised the 507th as one of the best units in the Air Force Reserve.

The 507th's flying organization, the 465th Tactical Fighter Squadron, is the third to operate F-16s in the Air Force Reserve, completing the 419th TFW as an all-F-16 wing. The wing's other units fly F-16As at Hill AFB, Utah, and F-16Cs at Luke AFB, Ariz.

Tinker AFB is the world's 50th F-16 operating site.



The 507th Tactical Fighter Group Is Converting from F-4Ds to F-16A Fighting Falcons

Effective Property Management Is Critical in Cost Competitiveness By Joe Stout

General Dynamics is strengthening its corporatewide approach to managing the billions of dollars in government and company property entrusted to company locations worldwide.

Effective property management has become increasingly critical for "staying in business" and being a more cost-competitive contractor, according to Robert J. McFarland, Fort Worth's Property Management Director.

An in-house property management training course held recently was a major milestone in the company's efforts to improve performance. The course was taught for the first time in late 1988 to more than 30 persons representing 14 company locations, plus Fort Worth's Air Force Plant Representative Office.



Ins and Outs of Managing Property. Fort Worth's Robert J. McFarland (standing) explains property management techniques to employees from throughout the corporation during the first totally in-house course on the subject. The curriculum covers considerations for both U.S. Government and General Dynamics assets.

The initial five-day course was conducted in Fort Worth by McFarland, who developed the curriculum, and John R. Wellington, Property Management Manager at Space Systems.

The course provides an overview of pertinent issues the company faces in managing U.S. Government and General Dynamics property, McFarland said.

The company previously paid consultants more than \$100,000 a year for property management training that centered on government regulations but did not address the full range of issues.

"The new course outlines the corporate structure for property management and the Corporate Policies and Procedures that relate to property," McFarland said. "In addition, it discusses the Corporate Property Council and the reasons why property management has become a top priority."

The Corporate Property Council, composed of East and West Coast task groups, meets annually to identify key objectives and concerns regarding property management. Development of the course was one of the council's 1987 objectives. Other courses have been developed for the property system audit, plant clearance and disposition of assets. In addition, an informational property management videotape was produced. It is being used corporate-wide in new-employee orientation.

General Dynamics' contracts make the company responsible for all government property entrusted to the company's use. The company is also required to be able to locate, "within a reasonable period of time," any particular piece of property upon demand by the government.

Penalties for nonconformance can include withholding progress payments, loss of future contracts and liability for

loss or damage of property, McFarland said.

General Dynamics has full responsibility for government property, including special tooling, facilities, special test equipment and agency-peculiar (customer-peculiar) material, in addition to other items.

Besides being a contractual requirement, efficient property management is "just good business," McFarland said, adding that the course emphasizes that the policies and methods used for tracking government property should also be applied to assets the company owns. "We try to help people realize that there is a practical reason for everything that is in the government regulations," he said.

"To become more cost-competitive, we need to develop maximum efficiency at using assets," he said. "For example, if we can determine that a special piece of equipment we need is available at another division, we may be able to realize substantial savings by putting it to use instead of buying a new one."

Good property management can help identify unneeded assets and save money disposing of them. Proper record-keeping also helps ensure timely maintenance of assets.

"The better we do these things . . . the lower the cost of our product," McFarland said.

The first property management course was attended by representatives of Pomona, Camden, Convair, Space Systems, Valley Systems, Data Systems, Fort Worth, Abilene and the Corporate Office. Other attendees were from GDSC and company offices in the Netherlands, Belgium and at Hill AFB, Utah.

The next scheduled property management course will be held at Space Systems in March.

Musical Performance Kicks Off Food, Clothing Drive for Chicago's Needy

A concert performed by students of The Crown Community Academy Fine Arts Center kicked off the Material Service Corporation, Marblehead Lime Company and Freeman United Coal Mining Company's food and clothing drive in January to benefit the hungry and homeless of Chicago.

Several hundred company employees and building tenants at Material Service's headquarters heard a medley of songs by the academy's chorus.

"The kids were great and this was a good way to spread a joyous spirit," said Gerald Nagel, President of Material Service

The Crown Community Academy Fine Arts Center, located on Chicago's south side, has 800 students in kindergarten through eighth grade.

It was adopted by Material Service in 1983 through the Chicago Public Schools Adopt-A-School program.

Material Service's support has enabled the academy to offer its pupils an enriched program in music, art, dance and drama. The academy also provides access to culturally stimulating experiences such as the recent concert, visits to live performances and Urban Gateway's resident artist program. In addition, traditional studies are available at the school.

The Greater Chicago Food Depository, known through-



Benefit Performance. Students from The Crown Community Academy Fine Arts Center perform in the lobby of Material Service Corporation's headquarters in Chicago.

out Chicago for feeding and clothing many of the city's homeless, will distribute the food and clothing through its

network of centers. Last year employees donated more than 4,000 pounds of clothing.

Firefighter Charlie T. Chaffee Lost a Leg But Not His Courage By Robert M. Driscoll

Some Good Samaritans have a rough time of it. The biblical traveler who helped the robbery victim was out a few denarii for his efforts, but others who have rushed to the aid of people in trouble have lost considerably more than money. Charlie T. Chaffee lost a leg.

Last May 31st, the 34-year-old Chaffee was on his way home after completing his shift as Inspector First-Class at Electric Boat's Fire Department when he came upon an accident scene.

With 17 years' rescue experience with the Old Mystic, Conn., Volunteer Fire Department, Chaffee instinctively stopped to help. While crossing the highway, and despite having looked both ways, Chaffee was struck by a car that had careened by the police warning devices.

Fortunately, surgery and intensive hospital care pulled him through his physical crisis, but in June his right leg had to be amputated at the knee. After that, learning to live with one leg was up to him.

In a matter-of-fact manner, Chaffee said he regards the incident as nothing more than bad luck. Characteristically, he looks on the positive side — saying he's alive, he is back on the job, and he has received the care and help of hundreds of new friends who rallied to his side when he needed them.

He singled out his wife, Dawn, for special recognition. "She kept me motivated, motivated to do the job," he said.

A large part of that job at hand was to learn to use an artificial leg, a task to be mastered before even considering a return to work. Coworkers cite Chaffee's pluck and determination as primary enablers to his speedy recovery.

His comeback involved many sessions of physical therapy, first in the hospital, next at home and finally at the

nearby Montville Return To Work Center, one of the new breed of private facilities nationwide dedicated to simulation of workplace conditions as the prime ingredient of any injured worker's therapeutic program.

"Our approach is very functional," said Center director Donald Brown. "If we want to know how someone would do climbing a ladder, we have them climb a ladder."

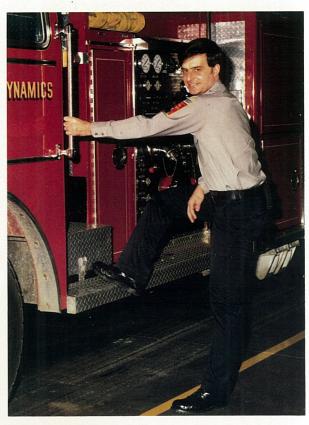
Climbing ladders was only one activity on Chaffee's agenda; others were to lock both feet between the rungs fireman-style, to crawl on his hands and knees through a maze with a weight (simulating an air-pack) strapped to his back, to push and haul a wooden sled loaded with weights and to execute quickly and efficiently a myriad of similarly rigorous occupational activities.

By early January, Chaffee felt he was ready to return to work. After consultation with the Electric Boat medical staff, Chaffee undertook a physical agility test at the Montville facility. He completed the test, which normally takes four hours, in one-and-a-half hours.

Shortly thereafter, he was notified that he could return to his job with no duty restrictions, an important goal during Chaffee's recovery and one that made all the hard work worthwhile.

Jan. 16th was Chaffee's first day back on the job. On hand to welcome him with a fire axe-decorated cake were a dozen or so of his coworkers, representing hundreds of Electric Boat employees and the region's rescue personnel who had rallied to Chaffee's support during his recovery.

Through their efforts, more than \$13,000 was raised for Chaffee's medical expenses. "I wish there was some way to thank them," he said. Judging from his past dedication to helping people in trouble, he'll find ways.



His Goal Attained. Having been given a clean bill of health, Charlie Chaffee has returned to work and is performing all of the functions that are required of his firefighter job.



General Gets Stinger Demonstration. Kaye B. Willet (right), Valley Systems Marketing Representative, discusses the operation of Stinger with Maj. Gen. August M. Cianciolo, Commanding General of the U.S. Army Missile Command, during the general's recent visit to the division. General Cianciolo also received product briefings from division executives and toured other facilities on the site.

Michigan Governor Thanks Land Systems

Michigan's Gov. James J. Blanchard recently thanked Land Systems for the participation of an employee in "one of the key partnerships in helping to match people and jobs."

John Brogowicz, Detroit Arsenal Tank Plant Labor Relations, serves as chairman of the Macomb County Job Service Employer Committee and as a member of the Michigan Job Service Employer Committee. The primary function of these committees throughout the state is to serve as advisors to the local Michigan Employment Security Commission Job Service Offices and as liaison

with the employer community.

"The Job Service Employer Committees play a vital part in Michigan's Human Investment System," said Governor Blanchard in a letter to Donald G. Norman, Land Systems Vice President—Human Resources, "and I want you to know that I appreciate the generous support that you have given to this effort by encouraging John Brogowicz to participate . . . Land Systems . . . can be very proud of this contribution to building the future of Michigan."

F-111 Wings Perform Well in SAC Competition

Fort Worth-built F-111 aircraft performed well recently in the U.S. Air Force Strategic Air Command (SAC) 1988 Bombing Competition at Barksdale AFB, La.

The 27th Tactical Fighter Wing from Cannon AFB, N.M., flying F-IIIDs, won the LeMay Trophy for most points scored in low level bombing, the Billy Mitchell

Trophy for conventional bombing and the best F-111 Crew Award.

The 509th Bombardment Wing from Pease AFB, N.H., flying FB-111A aircraft equipped with Avionics Modernization Program (AMP) enhancements, won the Meyer Trophy for the F/FB-111 unit with the most overall points.

Only One Rider Can View the Scenery on This 'Bicycle Built for Two' By Julie C. Andrews

Michael D. Patzer, a marketing representative for Commercial Launch Services, had a passing thought one day while riding his tandem bicycle with his wife, Cheryl: "What would it be like to ride if one were blind?"

The answer has come from about 30 friends who cannot see but who share his enthusiasm for biking as long as he is in the front seat to steer.

Several Saturdays a month, Patzer meets a group of people who have severe vision problems, some totally blind, and he spends the afternoon riding them around Balboa Park, a large city park near the center of San Diego. While he and his rider are pedaling up and down the park's avenues, the others stake their guide dogs, spread picnic blankets and wait their turn.

Introducing the simple joy of riding a bike to those who have never experienced it before is a satisfying activity for Patzer.

"First-timers' reactions are the best thing about giving the rides," Patzer said. "One 45-year-old woman had never been on a bicycle. She was very unsure of herself and scared, but we finally got on the road. She laughed out loud the entire time."

Although the group has 20 or 30 "regulars," every Saturday usually brings several newcomers. Patzer conducts a little training session for newcomers.

"Before we get on, I ask them to run their hands over

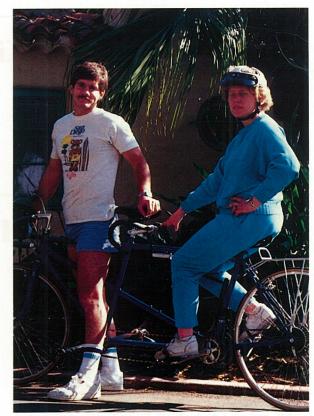
the handlebars and the seat," Patzer said. "I show them where I will be and what I will be doing. Then I show them the toeclips. Then they get on."

"We ride through Balboa Park, smell the flowers and hear the musicians," he said. "I try to describe what I see during the ride. My riders are very keen audibly, and a lot of the time they will hear things or be able to identify music long before I hear it."

Patzer said he had one rider who, although blind, worked out diligently with weights. "He was really in good shape. The speedometer on the bike was up to 30 mph before we had left the parking lot. I had to tell him to cool it."

Patzer said he got the idea about the tandem rides after his wife, an optometrist, saw an item in a professional journal about recreation for vision-impaired people. The San Diego Parks and Recreation Department sponsors the rides under the auspices of the Disabled Services Program. It provides two tandem bicycles, although Patzer brings his own from home.

"There's camaraderie on a tandem," Patzer said. "Think of sitting on a bike behind someone. A sighted person can tell where he is going and which way to lean. Think of covering your eyes while you're on the bike. You can hear a car go by very close and smell the exhaust. It's a good way to develop trust."



Michael D. Patzer and Passenger Lee Morton

James J. Cunnane Is Named Company's **Chief Financial Officer**

The company announced March 15th that James J. Cunnane has been appointed Corporate Vice President and Chief Financial Officer.

Cunnane

Cunnane has been Corporate Vice President and Controller, a position he assumed when he joined General Dynamics in 1978. He succeeds Standley H. Hoch, who has resigned from General Dynamics to accept the position of Chairman and Chief Executive

Officer of General Public

Utilities Corporation with headquarters in Parsippany, N.J.

Prior to joining General Dynamics, Cunnane was Treasurer of Gould, Inc., in Chicago and from 1971 to 1976 he was Corporate Controller of ITE Imperial until that company was acquired by Gould.

A native of Philadelphia, Cunnane graduated from St. Joseph's University in 1960 with a Bachelor of Science degree in Accounting. He received a master's degree in business administration from Temple University in 1967.

Cunnane is Chairman of the Subcommittee on Corporate Profits and Finance of the Financial Institute's Committee on Government Business. He serves on the Financial Council III of the Machinery and Allied Products Institute. He also is a member of the Aerospace Industries Association's Procurement and Financial Council and is Chairman of the AIA Financial Task Group.

General Dynamics Signs \$2 Billion Pact For MD-11 Fuselages

General Dynamics has signed an agreement with McDonnell Douglas for production of the fuselage sections for MD-11 jetliners. The total value of the agreement is expected to be about \$2 billion over the next six years.

"The MD-11 fuselage production program is a very important part of our business base," said John E. McSweeny, Vice President and Convair General Manager. "We are excited about the MD-11 program and its recent major sales and expect to be producing fuselages at Convair beyond the year 2000," he said.

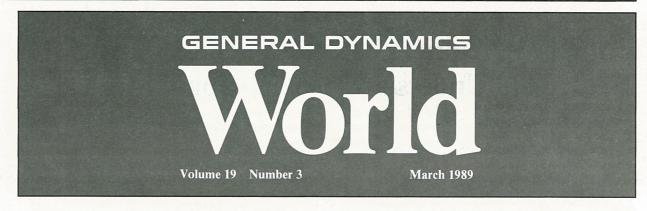
Convair has produced the fuselages for 387 DC-10s and 60 KC-10s over the past 20 years. MD-11 fuselage production will benefit from the facilities, tooling and working knowledge of the employees at Convair attained on the DC-10/KC-10 program.

The MD-11, produced by the Douglas Aircraft Company in Long Beach, Calif., is an advanced tri-jet derived from the DC-10 commercial airliner. The MD-11 features an all-new flight deck and interior, a two-pilot crew, improved performance engines and enhanced aerodynamics. It is 18.6 feet longer than the DC-10, providing approximately 45 more seats. Interior arrangements are also redesigned for more passenger comfort and convenience.

Convair delivered the fuselage sections for the first five MD-11s in 1988 and will deliver 13 shipsets this year. Production is expected to peak at around 50 shipsets per year in 1992.



Safety First. George A. LaCombe, Space Systems Senior Safety Engineer, accepts the Best Contractor Safety Award for 1988, presented by Col. Alexander A. Abela, Vice Commander of Western Space and Missile Center, Vandenberg AFB, Calif. More than 30 aerospace contractors have operations at Vandenberg, which is the third largest Air Force installation in the world.



Air Force Releases First Photo of B-52/ACM

The first photograph of the USAF/General Dynamics Advanced Cruise Missile being carried on a B-52H bomber has been released by Acting Secretary of the Air Force James F. McGovern.

Convair won a competitive selection in 1983 for fullscale development with follow-on production of the Advanced Cruise Missile. Designated AGM-129, the missile is a follow-on to the AGM-86B air-launched cruise missile currently in service with the Strategic Air Command, according to the Air Force release.

"Incorporation of advances in propulsion and guidance technology, along with low-observable design features, results in a system with improvements in range, accuracy and flexiblity," the Air Force said.

In a previous announcement by the Air Force, K.I. Sawyer AFB, Mich., was named as SAC's first operational base for the ACM. The ACM program is managed at the Air Force Systems Command's Aeronautical Systems Division, Wright-Patterson AFB, Ohio.

(See related story on Page 5.)



U.S. Air Force Photo of B-52H Carrying Advanced Cruise Missiles

First Guided Sparrow Missile Launch Made From an F-16B at Pacific Missile Test Center

An AIM-7 missile destroyed a target drone Feb. 23rd at the Pacific Missile Test Center off Point Mugu, Calif., in the first guided "Sparrow" launch from an F-16B Fighting

The missile was fired from F-16B No. 86, a test aircraft configured for evaluation of modifications being made under the U.S. Air Force's Air Defense Fighter (ADF)

The F-16A also has Sparrow launch capability with similar modifications.

The launch was made at an aircraft speed of 400 knots and an altitude of 20,000 feet during a flight from Edwards AFB, Calif. The head-on target, a BQM-34S drone, was traveling at 300 knots and 30,000 feet when it was destroyed at a range of 12 nautical miles, well beyond visual

The missile, with no warhead, made a direct hit on the 23-foot remotely piloted vehicle, breaking it in half.

Maj. Wayne Denesik, the Air Force Flight Test Center project pilot, described the mission as "smooth." Capt. Randy Walden, the flight test engineer who occupied the F-16B's aft cockpit, said all test objectives were met.

Five previous AIM-7 separation firings have been made from an F-16A under varying launch conditions of Mach number, altitude and "g" forces to expand the launch envelope. All launches have been rated highly successful, beginning with the first in October 1988. The test program will include eight additional launches, including three more

In addition, the 57th Tactical Fighter Wing at Nellis AFB, Nev., will conduct a number of operational F-16 AIM-7 launches this year.

The AIM-7 is an all-weather, all-aspect, medium range radar missile produced by General Dynamics and Ray-

theon Company. Sparrow capability is being developed for the F-16C/D through a separate program that will culminate in the first F-16C/D AIM-7 launch in the near

The incorporation of AIM-7 is a logical step in the F-16's evolution as an all-weather, day-or-night capable fighter. The F-16 was introduced in 1979 as the day-only "low" element in the U.S. Air Force's high/low fighter force mix. The addition of beyond visual range missile capability enhances the aircraft's air-to-air effectiveness.

F-16 AIM-7 capability is particularly significant for international air forces. The Sparrow option will complement the F-16's capability to carry and launch the AIM-120 Advanced Medium Range Air-to-Air Missile (AMRAAM).

General Dynamics developed an integral pylon/rail launcher that is used for both AIM-7 and AMRAAM on the F-16. Major F-16A/B aircraft modifications include addition of a Continuous Wave Illuminator for missile guidance, antennas, wiring provisions and an Enhanced Missile Remote Interface Unit.

In the F-16C/D, the target is illuminated for missile guidance with Pulse Doppler Illumination provided by the Westinghouse APG-68 radar.

A total of 270 aircraft will be modified in the ADF retrofit program. The Air Defense F-16A/Bs will be flown by 11 Air National Guard interceptor squadrons. The first ADF-modified aircraft will be delivered by the Ogden Air Logistics Center, Utah, in March.

The ADF aircraft are scheduled to achieve Initial Operational Capability in mid-1989. The first Air Defense F-16s will be operated from Kingsley Field at Klamath Falls, Ore.

Company Acquires Undersea Vehicles Firm To Expand Undersea Defense Capabilities

The company has acquired Applied Remote Technology, Inc., of San Diego, in a move to expand the company's undersea defense capabilities into unmanned undersea vehicles.

Terms of the acquisition were not disclosed.

As a wholly owned subsidiary of General Dynamics, Applied Remote Technology will apply its unmanned vehicle development capability to the defense market in cooperation with General Dynamics' Undersea Warfare Center. Ronald A. Walrod, President of Applied Remote Technology, will report to Gerald A. Cann, Staff Vice President of the Undersea Warfare Center.

The center, based in Washington, D.C., works with the U.S. Government on emerging programs in undersea

warfare. Applied Remote Technology will help the center respond rapidly to top-level customer requirements for undersea vehicles.

Applied Remote Technology was founded in 1984 and employs about 35 people who are experienced in developing underwater vehicles ranging from those that are remotely operated to large manned submersibles.

The company's efforts included the design, development and manufacture of a 30-foot autonomous underwater vehicle for a major defense contractor. The company has also designed and manufactured the XP-21, an underwater vehicle 21 inches in diameter. The vehicle was internally funded for testing advanced underwater technology and operational tasks for industry.



Management Honor. Dr. Alan M. Lovelace (center) is presented with the Gold Knight of Management Award by Space Systems NMA Chapter President Samuel H. Packer (left) and Walter E. Fiorentini, San Diego Council President.

Abilene Plant Ships Three Zero-Discrepancy F-16 Maintenance Trainers in Three Months

Three zero-discrepancy F-16 maintenance trainers have been shipped in the last three months from Fort Worth's new Abilene Facility North plant in Abilene, Tex.

They were the first assembled in the 200,000-square-foot-plant that began production last May.

The first two trainers, one for teaching fuel system technicians, the other for training on the ejection seat and canopy system, were shipped to the Hellenic (Greek) Air Force in December. The third, completed in late February, was a Block 40 ejection seat and canopy system for the U.S. Air Force.

Abilene's North plant also assembles F-16 gun system trainers.

Each system is designed and manufactured to be as realistic as possible, allowing the technicians to better understand problems described by pilots.

Instructors demonstrating the trainers can program specific system failures during training sessions.

"These are complex systems," said Kenneth E. Gunter, supervisor of the trainer assembly area. "Assembling three zero-defect systems was not easy. The employees who work on these systems have done an excellent job."

In addition to work on the F-16, Abilene Facility's two plants also produce components for Pomona's Phalanx weapon system and Convair's Cruise Missile and MD-11 programs.



F-16XL in the Air Again. F-16XL No. 1, the single-place version of the revolutionary, cranked-arrow wing technology demonstrator aircraft, takes off on March 9th for its first flight after more than three years in storage at Fort Worth. NASA will fly both of the F-16XL prototypes in a new test program scheduled to last three to four years.

Seven Valley Systems Division Employees Receive Eagle Awards for Notable Accomplishments

Seven Valley Systems Division employees have been named recipients of the coveted 1988 Eagle Awards of Excellence.

The following were cited for their accomplishments by Michael C. Keel, Vice President and Valley Systems General Manager:

Tempy Black, Staffing Administrator in the Human Resources Department, Excellence in Human Resources.

Dwight Brown, Manager-Contracts Administration, Excellence in Business Administration.

Jack Donham, Engineering Staff Specialist, Excellence in Engineering.

Willis Fagg, Stinger Flight Test Program Manager, Excellence in Program Management.

Robert Walter, Group Engineer in the Guidance Design Group, Excellence in Design for Producibility.

Robert Willman, Group Engineer, Excellence in Production/Production Transition.

Robert Wright, Assistant Director-Marketing, Excellence in Market Development.

The Eagle Awards of Excellence were initiated at Pomona in 1980 by then General Manager Ralph E. Hawes in order to recognize the outstanding contributions made by employees. When Hawes transferred to Valley Systems in 1985 as General Manager, he continued the Eagle Award of Excellence program. Hawes is now Executive Vice President-Missiles and Electronics.

Dr. Alan M. Lovelace Honored with NMA's Gold Knight Award

Dr. Alan M. Lovelace, Corporate Vice President and Space Systems General Manager, was presented with the Gold Knight of Management Award by the National Management Association on Feb. 14th at an event attended by representatives of all the San Diego Area Council NMA chapters.

The Gold Knight is the highest award an NMA council can give to an outstanding executive and is presented only once a year by each council. Selection is based on a widely known reputation in the area served by the council and promotion of the NMA ideals.

Space Systems' nomination said, "(Dr. Lovelace's) belief in the importance of each individual to the success of the team has been the hallmark of his management career here at both Space Systems Division and at the newly established Commercial Launch Services . . . his unpretentious manner and keen sense of humor serve to enhance his effective people-oriented style of management."

Presentation Given On Safe Submarine

Donald P. Blanchette, Education Services Specialist in the Education and Training Department at Electric Boat, has given a presentation to members of the Navy and the New England Chapter of the American Society for Nondestructive Testing on SUBSAFE, a program that supports the production of a safe submarine to quality standards at all levels.

Blanchette spoke at the Portsmouth Naval Shipyard at Portsmouth, N.H.

SUBSAFE requirements were instituted by the Naval Sea Systems Command after the loss of USS *Thresher* (SSN 593) in April 1963.

Homan Gets Gold Award

Steven A. Homan, a senior planner and scheduler in Land Systems Business Services, received a gold award from the American Production and Inventory Control Society on behalf of the Lima, Ohio, chapter he serves as president. The award is given to those chapters that have shown excellence in management.

Our Commitment As Employees

 We will treat one another fairly and with the dignity and respect due all human beings.

(From the General Dynamics Standards of Business Ethics and Conduct.)

Tips Given on Employee Use of Ethics, Personnel Ombudsman Hotlines

The Ethics and Personnel Ombudsman hotlines serve employees who have questions or concerns that they have been unable to answer or resolve by other means. The hotlines provide a convenient and easily accessible means of getting help.

According to Kent Druyvesteyn, Staff Vice President—Ethics Program, and Ozell Grissom, Corporate Director of the EEO and Personnel Ombudsman Programs, more than 11,000 calls and other contacts were made with Ethics Program Directors and Personnel Ombudsmen in 1988. While the two programs are organizationally separate, they work together on many cases.

Druyvesteyn and Grissom said that employees are becoming increasingly comfortable with contacting either an Ethics Program Director or Ombudsman. Such contacts are made by hotline or regular phone or by letter or visit. "More and more employees are simply walking into our offices and asking their question," Druyvesteyn said. "There has also been a decline in anonymous contacts, indicating confidence is growing in the responsiveness and discretion of the two programs." The two directors noted, however, that "some individuals are still uncertain about how the hotline/communication programs work."

"One question we hear," Grissom said, "is 'who answers the hotlines?" The answer is the Personnel Ombudsman or Ethics Program Director. These individuals have been instructed to identify themselves. If the Personnel Ombudsmen or Ethics Program Directors fail to identify themselves, the caller should ask for their name."

Another question often heard is whether an individual caller may remain anonymous. "We always tell callers they need not identify themselves although more than 80 percent do leave their names," Druyvesteyn and Grissom said. Druyvesteyn added that "we explain to callers who choose to remain anonymous that we will not be able to get back to them easily and that this may also slow down

situations that involve investigations. But no one is ever obligated to identify himself."

Grissom said that "the hotlines may be used 24 hours a day and seven days a week. Of course, the Ombudsmen and Ethics Program Directors are not there all of the time, but an answering device may be used to leave messages. The answering machines are locked away and accessible only to Ethics Program Directors and Ombudsmen who will attempt to get back to the caller as soon as possible."

"Sometimes getting back to a caller turns out to be quite a challenge," Druyvesteyn said. "When I return calls, I normally do not leave messages if the person who called me is not there. Sometimes callers to the Corporate Office also forget to leave their area code or they give me a number that can be reached only from within their plant. But we keep trying." Druyvesteyn advised that if a caller leaves a message and doesn't hear from the Ethics Program Director or Ombudsman, the caller should call back. "We may have been trying to reach the caller and have been unsuccessful."

The two directors stressed that all calls and communications will receive a response, unless of course there is no means of getting back. Sometimes the response may not be as prompt as desired, but callers should never hesitate to inquire what is happening.

Druyvesteyn and Grissom also said that while not all cases can be resolved to everyone's satisfaction, all concerns are treated seriously and with discretion. If callers are dissatisfied with the outcome, they are encouraged to say so and give the Ethics Program Director or Ombudsman another opportunity to respond.

Druyvesteyn and Grissom gave the following tips to employees on whom to contact when questions or concerns arise:

• Generally, questions or issues involving employee

relations or human resources are taken to a Personnel Ombudsman.

- Questions or concerns pertaining to specific issues of conduct involving relations with customers, suppliers, shareholders or the communities in which the company conducts business generally go to an Ethics Program Director.
- The following listing shows the kinds of calls generally handled by the Ethics Director or Ombudsman.

CATEGORIES OF QUESTIONS OR ISSUES TYPICALLY HANDLED BY:

Ethics Program Director

Gifts, Gratuities & Entertainment **Inside Information Outside Interests** Former Government **Employees** Selling/Marketing Antitrust Pricing, Billing & Contracting Time Card Reporting Suppliers & Consultants Quality & Testing **Expense Reports** Company & Customer Resources Security **Political Contributions Environmental Actions** Safety & Health International Business Proper Use of Ethics Program

Personnel Ombudsman

Benefits Compensation Discipline Discrimination Training & Development **Employment** Harassment Interpersonal Skills Management Practices Leaves Performance Appraisal Recognition/Awards Promotions/Demotions Reductions in Force Transfer **Working Conditions**



Annual Report Cover. Convair photographer Tim Whitehouse grabbed the gold ring when he photographed Space Systems Division technician Donald M. Digenan working on the stainless steel interior of the Centaur upper stage. Whitehouse's picture was selected by the Corporate Communications department for the front cover of the company's 1988 Annual Report, now being distributed to shareholders and others. While Atlas or Centaur space launch vehicles have appeared on four previous front covers since the company's first report was published in 1952, this is the first "inside" look at one. The 48-page report was written by Corporate Communications and Finance and designed by Bruce E. McIntosh. It is being mailed to all employee shareholders at their homes and is available to other employees at division Public Affairs offices.

Fort Worth's Bill Potts Works Toward Reality In 'I Have a Dream' Program in Texas By Joe Stout Fort Worth's Bill J. Potts is doing all be sen to inctil a sequence guesseded in Josephy.

Fort Worth's Bill L. Potts is doing all he can to instill a dream in the minds of two fifth grade students. When the dream is firmly planted, he'll do his best for the next seven years to help make that dream a reality.

The dream is graduating from high school and enrolling in college, which many people might take for granted. For many children in southeast Fort Worth, where Pott's young friends live, it is often a long shot.

Potts, a Numerical Control engineer, is one of 30 adult mentors in the "I Have a Dream" program, which offers a brighter future to 62 students who were enrolled in McRae Elementary School's fourth grade last year. He works with the children as a representative of the "I Have a Dream" Foundation, which has promised to provide a two-year Tarrant County Junior College scholarship to each class member who finishes high school on schedule. Some of the students now attend other schools but have remained in the program.

"A lot of the children are from economically disadvantaged families or what you might call broken homes," Potts said. "To them at this point, college is nothing but a word. We are trying to tell them that if you beat the odds, you can make things better for yourself.

"We can't change their present living conditions or home life, but we can say don't use drugs and if you stay in school, you've got a much better chance."

The program is modeled after a similar one founded in New York City by philanthropist Eugene M. Lang. Lang's original program succeeded in keeping more than 74 percent of students in school, Potts said.

Potts and the other advisers serve as role models for their assigned youngsters. The advisers attend monthly motivational meetings with the students and contact them at least one other time during the month to offer encouragement. For example, Potts has treated his two friends to a library visit and pizza as a reward for their efforts in school.

This is the first year for "I Have a Dream," which was founded by Mollie Lasater, former president of the Fort Worth School Board. Raul Gutierrez, the foundation's coordinator, said the program seems to be getting off to a good start.

"The personal involvement is what distinguishes this program from a traditional scholarship program," Gutierrez said. "You can see that the bonds between the students and advisers are getting stronger and stronger each time we meet."

The scholarships will be sponsored with donations and proceeds from fund-raising events, Gutierrez said. "This is a community-supported project. As long as there is community support, it will continue and expand."

Potts learned of the program through his wife, a staff member at McRae Elementary school. He said he volunteered to be an adviser "as a way of trying to change the world a little bit."



'I Have a Dream' Program. Fort Worth's Bill L. Potts (center) with students James and Andre, sitting to his left and right. Potts is serving as their mentor as they work toward a college scholarship that will be available to them upon high school graduation.

World World

Published by: General Dynamics Corporation Pierre Laclede Center, St. Louis, Mo. 63105

Manager of Internal Communication: Edward D. Williams

Contributors: Julie Andrews, Graham Gavert, Don Gilleland, Myron Holtzman, Dean Humphrey, Jack Isabel, Dave Lange, Jerry Littman, Jack Price, Tom Rule, Chris Schildz, Joe Stout, Joe Thornton

Company Conducting Informational Program To Stress 'Need-To-Know' Security Principle

As a result of recent espionage cases, the U.S. Government is re-emphasizing the "Need-To-Know" principle in the handling of and access to classified information.

General Dynamics has initiated corporatewide actions to stress the importance of this principle and to ensure its thorough understanding among employees.

A memorandum issued by the Office of Corporate Security to Security Directors and Managers at all company locations requests them to emphasize and explain "Need-To-Know" through posters, news bulletins and articles in division publications.

Access to classified information is granted only when an employee has a valid and current security clearance as high as the information to be released and if the employee requires access in order to perform tasks essential to fulfillment of a classified government contract or program. The latter condition is the "Need-To-Know."

"The 'Need-To-Know' principle is as old as the government's policy of classifying certain kinds of information," said William I. Ferrier, Corporate Director of Security. "Now we have to remind our people that 'Need-To-Know' is just as mandatory a principle in gaining access to information as the appropriate security clearance level. The Defense Investigative Service is particularly concerned that this is understood and followed. At General Dynamics, adhering to this principle, coupled with our strong overall security procedures, certainly will help assure us of remaining 'A Strong Company for a Strong Country.'

Black History Month Celebrated at Luncheon

"Our activities today will be the black history celebrated tomorrow."

This prediction was made by Frederick S. Wood, Executive Vice President—Contracts, Pricing & International Offset, at a Black History Month luncheon Feb. 23rd at Pomona.

"Each of us has our own history — one that may not make the front pages of the Los Angeles Times or the St. Louis Post-Dispatch," Wood said. "But I think our own personal history is typical of what we celebrate here today."

"By taking full advantage of opportunities, blacks can accomplish a great deal," Wood told the audience of more than 250 employees. "I have always believed that a person can make a difference. But you've got to give it your best shot."

Wood said that after his graduation from Navy Officer Candidate School in 1946, he was one of only seven black officers in the Navy. "Today, the armed services are bastions of equal opportunity," he said. "That is a measure of progress — of how far we have come."

Wood said he believes education is the key to opportunity. He is concerned that a greater number of young people are dropping out of school, a problem, he said, that adults should not permit.

Wood said that in the past, many blacks were told "No" only because they were black. But, he warned, today's



Keynote Speaker Frederick S. Wood

children may be told "No" because they are not prepared.

One may or may not achieve success, he said, but the effort must be made regardless.

"Thanks to those who tried before us, we have the best country in the world," Wood said. "I'm proud to be a part of its history."

Cessna Aircraft Company Sells Its Interest In Reims Aviation, S.A., to French Firm

Cessna Aircraft Company has sold its interest in its French associate company, Reims Aviation, S.A., to Compagnie Francaise Chaufour Investissement (C.F.C.I.) of Paris.

Terms of the agreement were not released, but officials of both companies emphasized that Reims Aviation will continue to build the Cessna F406 Caravan II utility turboprop aircraft at its facility near Reims, France.

In addition, C.F.C.I. retains the right of first refusal to assemble Cessna's single-engine piston aircraft when Cessna resumes production of those models. Cessna suspended production of all piston-engine aircraft in 1986.

Cessna purchased its interest in Societe Nouvelle des Avions Max Holste in 1960. The company was renamed Reims Aviation in 1962 and moved to its present location at Reims-Prunay airport in 1967. The company has assembled more than 6,300 Cessna aircraft, including 12 single-engine models and four twin-engine models.

Reims Aviation also is a major subcontractor for French

aerospace companies that build airliners, Dassault Mirage jet fighters and Falcon business jet aircraft. The company has more than 500 employees and reported sales of \$220 million in 1988.

In announcing the agreement, Cessna Chairman Russell W. Meyer Jr. said Cessna and C.F.C.I. are committed to maintaining the strong relationship that Cessna and Reims Aviation have built during their 29-year association.

"Cessna will continue to support Reims Aviation's currently planned Caravan II production schedules," Meyer said, "and we will continue to market and support the Caravan II worldwide."

C.F.C.I. is headed by brothers Jean Paul and Jean Pierre Chaufour. In recent years, the company has acquired several general aviation firms and several builders of large passenger and cargo ships, as well as manufacturers of pleasure and sport fishing boats. The Chaufours also are principals in Dumez, a major construction firm in Errance

Material Service Acquires Two Companies

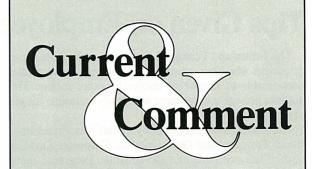
As part of its continuing business plan to increase market share, Material Service Corporation has acquired Dealers Ready Mix Company of Highland Park, Ill., and La Crosse Concrete Company of La Crosse, Wis.

Located in a northern suburb of Chicago, Dealers Ready Mix Company is a producer of ready mix concrete, including decorative and specialty concrete products. It services residential, commercial and industrial construction projects throughout the highly competitive north suburban construction market.

La Crosse Concrete Company is a manufacturer and

distributor of concrete pipe and associated pipe products. The plant, located in Holmen, Wis., just north of La Crosse, is compatible with Material Service's other pipe operations and delivers products throughout the north midwestern states. La Crosse also distributes metal castings, cast iron manhole covers, PVC pipe and fittings, truss wall pipe and metal culverts.

Material Service said it has decided to retain Dealers and La Crosse management teams because of their knowledge of the market and customer needs.



A NEW '92. The plan by the 12 member countries of the European Community (EC) to do away with all fiscal, physical and technical trade barriers among themselves in 1992 has drawn increasing attention and scrutiny from other nations. The resultant size of this new market, comprising 320 million persons and estimated at a worth of \$4 trillion, has prompted warnings of a "Fortress Europe" from some. The head of the EC delegation to the U.S., Sir Roy Denman, calls such warnings "absurd." Denman notes such a protectionist idea would be self-defeating because of Europe's current large 20 percent stake in world trade.

IT'S TRUE. General Dynamics built 113 twinboom P-38 Lightning fighters in Nashville, Tenn., during World War II.

Technically, it was Convair, one of the founding divisions of General Dynamics. Known in 1943 as "The General Motors of the Air," Convair also built Vengeance dive bombers at the Nashville plant, today the site of Textron's Avco Aerostructures operation.

(... this thanks to former P-38 combat pilot Tom Gordon, Manager of Corporate Travel, who retires this month after more than 19 years with the company.)

HARDWARE MAKES A DIFFERENCE. How important is the technological edge? Ask Russian pilots. The British magazine *The Economist* calls the nine-year Afghanistan conflict "The war that Stingers won." Said the editors: ". . . the Russians went home — vanquished by a rugged resistance and a clever piece of modern machinery." Commented NBC-TV's John Chancellor: "If the Afghan rebels hadn't had Stinger missiles, the Russians would be there today. . . One nearsighted soldier with a heat-seeking missile can knock out a \$1 million helicopter. Talk about cost-effectiveness."

HOPE AFTER ALL? Quoted in the National Journal, the executive director of the RCFPW (that's the Reporters' Committee for Freedom of the Press in Washington) said: "There is a heightened sense in American society of the individual (right) to be left alone. . . . Unless we get a strong signal from the Supreme Court on the issue as it relates to the press, it could become very scary and constrict news gathering severely."

INSPIRATION. Land Systems engineer Gina Wilson, who two years ago founded "Project Inspiration" to attack a growing illiteracy problem in her home town of River Rouge, Mich., was recently featured on Detroit's NBC-TV affiliate. Her night school math classes for elementary students came to the attention of WDIV-TV through GD's newly published Community Relations brochure ("Together"). The brochure has received continuing favorable recognition nationwide from public and private individuals and groups, industry, academia and government, as well as from the news media and others. (A copy was given by Missouri Senator Kit Bond to President Bush during a Presidential visit to St. Louis.)

Savings and Stock Investment Plans

Annual Rate of Return for the 12 Month Period Ending:

Jan. 1987	Jan. 1988	Jan. 1989	
10.6%	6.6%	6.5%	
35.5% 11.8%	(3.7)% 11.5%	20.7% 10.6%	
10.2%	6.7%	6.6%	
36.9% 11.6%	(3.8)% 11.5%	21.2% 10.5%	
			\$74.00
umber			
	1987 10.6% 35.5% 11.8% 10.2% 36.9% 11.6%	1987 1988 10.6% 6.6% 35.5% (3.7)% 11.8% 11.5% 10.2% 6.7% 36.9% (3.8)% 11.6% 11.5% \$74.00 \$52.25	

Total Quality Management Is Critical in Company's Leadership By Joe Stout

General Dynamics is undertaking a major initiative toward improvement with its corporatewide commitment to Total Quality Management (TQM) in all company activities.

Chairman and Chief Executive Officer Stanley C. Pace and Herbert F. Rogers, President and Chief Operating Officer, have described TQM as a critical factor in the company's bid to maintain leadership in the U.S. defense industry and global competitive environment.

TQM's promise of fielding the highest quality weapons systems at the lowest possible cost has made it the byword of the Defense Department. The U.S. Air Force's Aeronautical Systems Division, responsible for the development and procurement of Air Force systems, has been a leader in the Defense Department's introduction of TOM.

As one of the Air Force's largest suppliers, Fort Worth has seen ample evidence of the USAF's TQM thrust, according to Charles A. Anderson, Vice President and Fort Worth General Manager.

Anderson said the company's initial task should be to clarify exactly what TQM is and, conversely, what it isn't. "Management can put out great proclamations and write fantastic memos, but unless the total company accepts the idea and buys into it, it won't work," he explained.

Lt. Gen. Mike Loh, Commander of the Air Systems Division, also stated that TQM is not a signal for "more hot air, more posters and more press releases."

"I hope we're making it very clear that we're serious at all levels of the division and corporation," Anderson said. "We have to change our philosophy... we must change the way we function. We're really trying to create a new attitude in the way people approach their jobs, whatever they are."

Willie C. Livingston, recently appointed by Anderson

to serve as Director-TQM at Fort Worth, said the TQM "philosophy" includes several major principles. "The first is what we call the customer focus," Livingston said. "Everyone in the company has a customer — the guy in the next department who installs the airplane part you assemble, the person who reads the memo you type or the recipients of the data you provide to satisfy other requirements. The definition of quality, in this case, is that the customer is satisfied with the quality of what you produce."

Another major TQM principle is the prevention, as opposed to detection, of errors. "We have to create an 'inspectionist' environment that doesn't produce mistakes, rather than an environment dependent on inspectors who catch mistakes," Livingston said.

Other TQM principles call for changes in processes and procedures to eliminate activities that don't contribute to efficiency or the value of the product. "We want to make it so the policies and procedures of the company actually help the employees do their jobs to the maximum extent possible," Livingston said.

Anderson said he believes it is management's responsibility to remove impediments to quality performance and that TQM's goal is to create a General Dynamics culture where each employee has the responsibility and authority for the quality of his or her work. "There isn't a person in the company, or in this country, who wants to come to work and do a bad job," he said. "People get frustrated because of things in their way that make it so they can't do a good job, and that's where management has to help."

"Small things that hold us back, day in and day out, are going to be solved by the people doing the work," he said. "We have to understand that we all work for the same

goal. TQM can only exist in an environment of trust between the employee and the company."

Livingston said TQM has a ready-made relationship to numerous other initiatives that the company has undertaken to affect quality, cost and efficiency at its various locations during recent years. "We already have many programs that can serve as the tools of the TQM initiative," he said.

"These include Taguchi methods, Statistical Process Control, Engineering Quality Improvement, Employee Involvement and the Employee Survey process, just to name a few," Livingston said. "TQM goes deeper, however, to become the essence of why we are doing these things. It is becoming our corporate attitude."

The groundwork for TQM use at Fort Worth has been established with the creation of Livingston's position and a staff for the division effort. Each functional department will also have a TQM facilitator who will be part of a division team for TQM. An extensive TQM preparation effort is scheduled to begin in June with a three-day session for Anderson and each executive reporting directly to the general manager.

A corporate steering committee to develop the TQM approach throughout the company has also been established in St. Louis. Grass roots implementation will be achieved through individual efforts tailored to meet specific needs of the various divisions, Livingston said.

Achievement of TQM goals is a long-range process that will extend well into the 1990s, Livingston said. "It will take an extended commitment to make this work," he said. "And we have to make it work, because our competitors will."

Fort Worth Supports Schoolbook Program With Donation, Tour

Fort Worth recently donated \$10,000 to the Fort Worth Independent School District's Reading Is Fundamental program.

The money will be used by the district to buy books for three years for children at an elementary and a middle school in the city.

Students from the two schools visited the plant and were shown an F-16 Fighting Falcon by Chief Test Pilot Steve Barter.

During a brief ceremony, Charles A. Anderson, Vice President and General Manager, told the students about the importance of being able to read.

"A literate America is becoming a more significant factor to business as each day goes by," he said. "You, who represent the work force of the future, will need to be able to understand and interpret data in order to successfully complete your training."

While describing flying a multimission jet fighter, Barter said that a good education was necessary for his job and for most other jobs.



School Support. School children select from books bought with money donated by Fort Worth as Charles A. Anderson, Vice President and General Manager (rear, left), and School Superintendent Donald Roberts watch. The division donated \$10,000 to the Fort Worth Independent School District's Reading Is Fundamental program.



Supplier Conference Attendees Got an Up-Close Look at One of the ACM Launch Platforms — the B-52 Strategic Bomber

Advanced Cruise Missile Suppliers Are Told About the Importance of Team Building By Julie C. Andrews

The importance of team building to Convair and its subcontractors was the theme of a supplier conference conducted by the Advanced Cruise Missile (ACM) program office recently at Edwards AFB, Calif. Convair strongly emphasizes subcontract management, and the conference was intended to provide a productive, positive experience for attendees.

Sixty suppliers were invited to participate in discussions with their Convair and Air Force counterparts during the two-day session. The suppliers also toured the Edwards facilities for a better understanding of the environment in which weapon systems are tested.

Bernie J. Kuchta, Convair Vice President and ACM Program Director, said in his welcome:

"The contractor-supplier relationship has never been more important than now when ACM is moving from development into production. Self-criticism is healthy and is required by all parties to build a better team."

Col. Francis V. Barnett, ACM Program Director, Aeronautical Systems Division (ASD), also stressed the need for government and industry to work together for improved quality and reliability, particularly in an era of spending cutbacks.

In his "Cruise Missile Reliability Today" presentation, President and Chief Operating Officer Herbert F. Rogers noted the difference in reliability discriminators for a system like the cruise missile as opposed to the F-16 Fighting Falcon and that the test philosophy and approach will have to be different for next-generation cruise missiles. Rogers said that Convair intends to be the pre-eminent cruise missile contractor.

Since beginning its Integrated Subcontract Management initiative last year, Convair has concentrated on streamlining its relationship with suppliers. Before the ACM conference, subcontractors were sent a survey asking them

to comment on various aspects of their working relationship with Convair and the Air Force.

Donald L. Brechtel, ACM Procurement Manager, presented the survey results in the kickoff meeting and appealed to subcontractors to look at a "we succeed, you succeed" team concept as they discussed the negative and positive responses the next day.

Participants agreed to a series of action items evenly split among Convair, the subcontractors and the Air Force. Convair's actions include increasing the flow of quality information, reducing the flow of engineering documentation and last-minute changes and fully defining the requirements up front. Col. Barnett said that ASD would try to reduce its source inspection requirements and would get better Requests For Proposals out to contractors.

The feedback from this survey will be used to prepare a similar survey for next year's supplier conference.

Russ N. Babcock, Convair Division Vice President—Procurement, concluded the conference by describing "Impact 2000," the corporate subcontract management initiatives.

"We intend to forge strong relationships with our suppliers, relying heavily on those companies that can work within our program of Total Quality Management to achieve on-time deliveries at least cost," Babcock said.

Said one supplier: "The ACM Supplier Conference is the best one I have attended in my 20 years in the defense industry."

The conference provided an unexpected treat for the attendees: Their visit coincided with the landing at Edwards of the Space Shuttle *Atlantis*. They also sat in an F-16 and viewed a B-52 bomber, one of the ACM launch platforms.

Land Systems, FMC Get Army Contract For Joint Venture

Land Systems' joint venture with FMC Corporation—Armored Vehicles Technologies Associated (AVTA)—received a \$16-million contract from the U.S. Tank Automotive Command for the second phase of an advanced program to develop an electronic system that will control a wide variety of vehicle functions.

Called SAVA II (Standard Army Vetronics Architecture), the program calls for a data distribution, control and processing system for the next generation of combat vehicles. The electronic systems will be the vehicle's central nervous system.

Four companies were awarded separate contracts for Phase I of the program, a conceptual stage that involved devising a basic overall approach and building a Vetronics System Architecture Demonstrator. Phase II will build on those concepts and technologies and will culminate in a more advanced demonstrator that will be only one step away from the actual vehicle system.

To pursue Phase II, AVTA put together a team of the companies that were involved separately in Phase I—General Dynamics, FMC, General Electric and Texas Instruments.

According to FMC's David De King, assistant SAVA program manager for AVTA, the joint effort has several advantages. "It has advantages for the companies because it ensures that everyone involved in Phase I will be able to contribute to Phase II," he said. "It is equally advantageous for the customer because the companies wanted to take the best features of the Phase I contracts and develop a consolidated architecture."

SAVA II will run through Jan. 31, 1992.

Engine Competitors For X-30 Announce Important Milestones

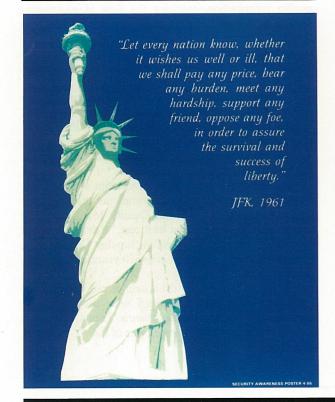
Pratt & Whitney and Rocketdyne, the companies working on competitive development of engines for the National Aero-Space Plane (NASP), or X-30, announced significant milestones recently.

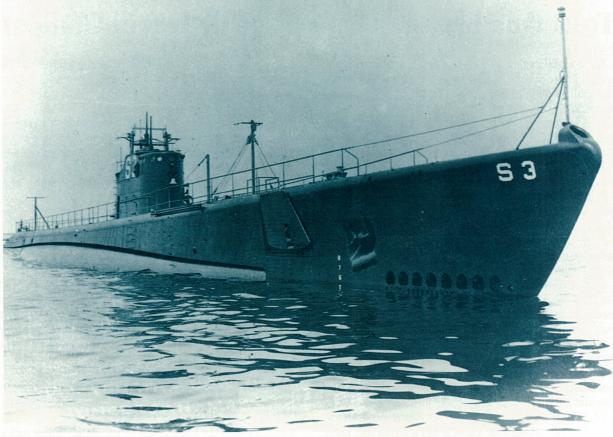
General Dynamics is one of three companies working competitively on preliminary X-30 airframe designs. The work is being accomplished at Fort Worth with assistance from Convair and Space Systems.

New propulsion technology is a key part of the program, since the X-30 is being designed to operate at speeds ranging up to Mach 25.

A Pratt & Whitney official said the company has successfully tested a heat pipe that can withstand temperatures up to 3,500 degrees — as hot as it would be expected to get at Mach 20. He said the X-30 cannot be developed without an inlet heat pipe capable of surviving great temperature fluctuations.

Meanwhile, Rocketdyne announced construction of a hypersonic flow laboratory sized for full-scale engine components and capable of simulating hypersonic flight speeds up to orbital-speed conditions. The laboratory will be completed in early 1990 and is believed to be the only one of its kind in the world.





USS Skipjack Was First to Fire "Down the Throat" Torpedo That Sank an Enemy Ship

General Dynamics Flashback

Skipjack Refused to Die in WWII By Myron R. Holtzman

Like a cat with nine lives, USS Skipjack (SS 184) just wouldn't die during World War II. The submarine survived 10 war patrols, a faulty supply of torpedoes — and even a postwar sinking during atomic bomb experiments — only to surface again.

Launched Oct. 23, 1937, at Electric Boat and commissioned on June 30, 1938, *Skipjack* served in the South Pacific, where she earned seven battle stars for outstanding service.

However, *Skipjack* may be best known as the first submarine to fire what is now known as a "down the throat" torpedo payload that sank an enemy vessel.

On May 6, 1942, during her third war patrol, *Skipjack*, under the command of Lt. Cmdr. James W. "Red" Coe, sailed into Camranh Bay, Indochina, and contacted a Japanese cargo ship. As Coe, who was making his first patrol as the submarine's commander, moved in for the kill, he found himself dead ahead of the oncoming Japanese ship. Coe fired a spread of three torpedoes "down the throat" of the *Kanan Maru*, sinking her.

An escorting destroyer moved in and worked over *Skipjack* with 39 depth charges. However, the destroyer inflicted no damage.

Skipjack had survival instincts from the very beginning. She underwent training exercises at Pearl Harbor, but she was away in the Philippines undergoing repairs on Dec. 7, 1941, when the Japanese attacked the Hawaiian Islands. Under the command of Lawrence "Larry" Freeman, Skipjack left immediately for Samar on her first war patrol.

However, the combat performance of the *Skipjack*, the second of three submarines named after the kind of fish that jumps above the surface of the water, started with little success.

In her first contact with the enemy, *Skipjack* came up short — literally. On Christmas Day, Freeman had sighted a precious target — a Japanese aircraft carrier with only a single destroyer escort. It marked the first time that a U.S. submarine encountered a Japanese carrier. Freeman took *Skipjack* down to 100 feet and moved into a range estimated by his sonar operator at 2,200 yards and fired three torpedoes. All missed. Later, the sonar operator admitted he may have underestimated the distance by as much as 800 yards. Freeman noted in his log, "It was not a very Merry Christmas after that"

The second patrol also came up empty, and Freeman was relieved from command and replaced by Coe. Freeman later wrote, "Although I was told that I was being relieved in order to give me a physical and mental rest after exhaustive patrols, I'm sure that the fact that the *Skipjack* had not inflicted any damage on the enemy had a great deal to do with this decision — in fact I think it was the primary reason."

Coe was more successful and immediately gained fame with the "down the throat" sinking. Two days later, *Skipjack* intercepted a three-ship convoy escorted by a destroyer. She fired two torpedoes that severely damaged a merchant ship, then sent four more that sank the cargo ship *Bujun Maru*. Several days later Coe's crew completed a successful patrol with the sinking of the passenger-cargo ship *Tazan Maru* off Indochina for a total of 12,800 tons sunk.

In terms of confirmed ships sunk, this was the best score achieved on a single patrol. However, Coe also saw several of his torpedoes pass directly under other targets, prompting him to write:

"I now have little confidence in these torpedoes . . . to make round trips of 8,500 miles into enemy waters to gain attack position undetected within 800 yards of enemy ships only to find that torpedoes run deep and over half of the time will fail to function, seems to me an undesirable manner of gaining information which might be determined any morning within a few miles of a torpedo station in the presence of comparatively few hazards."

Other submarines also had problems scoring hits, and tests were ordered on the U.S. Mark 14 torpedoes. *Skipjack* participated in the tests, which concluded the torpedoes indeed exploded prematurely or ran at least 10 feet lower than set. Submarine commanders were instructed to subtract 11 feet from whatever depth setting they chose. The cure immediately brought results, although premature explosions persisted.

Skipjack severely damaged a Japanese oiler on her fourth patrol and while sailing near the Palau Islands on her fifth patrol, the submarine sank the 6,781-ton cargo ship, Shunko Maru. The submarine survived a severe depth charge attack after the sinking and returned to Pearl Harbor.

The submarine's next three patrols were unproductive. But on her ninth outing, under the command of George Garvie Molumphy, success again came her way. On Jan. 26, 1944, Molumphy intercepted a convoy that included a seaplane tender and a destroyer escort, which was bringing more Japanese reinforcements to Eniwetok during the U.S. invasion of the Marshall Islands. Molumphy made a submerged approach at radar depth and fired four torpedoes that sank the destroyer *Suzukaze*. He then fired stern tubes at the seaplane tender, missed the ship, but hit and sank a merchant ship.

During the attack, one of *Skipjack's* torpedo tube valves stuck open and a torrent of seawater flooded the torpedo room. Before valves could be closed, the submarine took on 14 tons of water. By the time control of the boat had been regained, water in the torpedo room was only a few inches from the top of the watertight door.

Miraculously, there were no casualties. Through fine seamanship, the submarine righted itself and Molumphy resumed the attack, catching up with the convoy and sinking the seaplane tender.

The submarine's 10th and final patrol was in the Kuril Islands where she damaged an auxiliary ship and attacked a destroyer without success. *Skipjack* returned to Pearl Harbor and was retired from combat.

In July 1946, *Skipjack* took part in tests at the Bikini Atoll in the Pacific to determine how well warships could survive an atomic attack. *Skipjack* was among eight submarines that were placed at various depths. She was sunk in the second atomic bomb test.

However, she was raised and towed to Mare Island. On Aug. 11, 1948, the *Skipjack* used her last life as a target for aircraft rockets off the coast of California. She was finally stricken from the Navy's list on Sept. 13, 1948.

Video Teleconferencing Technology to Be Used Corporatewide By Myron R. Holtzman

Within the next few months, installation of a new video teleconferencing facility will begin at the Corporate and Washington offices. The new system will provide employees in St. Louis and Washington the opportunity to communicate both in sight and sound with upgraded video conferencing sites at company divisions.

"In an effort to improve employee productivity, enhance communications and reduce travel expenditures, the company has elected to implement a corporatewide five-node (or location) video teleconferencing system," said Herbert F. Rogers, President and Chief Operating Officer.

In addition to new facilities in Washington and St. Louis, existing systems slated for upgrades include Pomona, which will accommodate Pomona and Valley Systems; San Diego for Convair, Data Systems-Western Center, Electronics and Space Systems; and at Fort Worth for Fort Worth and Data Systems-Central Center. These three sites will be compatible with the new facilities.

The concept has several distinct advantages, according to Robert L. Gallo, Corporate Director-Facilities.

The economic factor is one of the main reasons many

companies around the country are using video teleconferencing. Travel costs are high and climbing. Air fares, meals, rental cars and hotel rooms are a major expense.

In addition, time spent for travel to attend a meeting that lasts only a few hours normally can be utilized more productively.

"Studies have indicated that decisions can be made more efficiently using this technique," Gallo said. "More people can participate in a very cost-effective meeting. With this system, a two-hour program review will only take two hours"

Video teleconferencing provides a level of communication not possible over the telephone, adding facial expressions and other body language. Graphic material — a chart, graph, photos or designs — also can be shared.

All five nodes will be operational by July 31st. Each facility will house high quality audio and visual systems, including three 35-inch monitors, one of which will be devoted to graphic displays. There also will be several 13-inch monitors for graphics set on the tables of the conference room. The system will be full-motion, will

transmit in real time and will have encryption capability for proprietary information. It will not be used for classified material.

Cameras will be mounted strategically above the screens to view the entire room and will have zoom capabilities to focus on an individual presentation. A high-quality duplex audio system will be used. Each facility will accommodate 18 people.

Expansion to other General Dynamics locations is likely in 1990.

"Several General Dynamics program teams as well as other companies have found these systems to be excellent communication tools," Gallo said. "Real communications and real productivity improvement are the keys here. I see this as strategically beneficial as our electronic mail system."

Eventually, Gallo said, the system may be linked into systems at banks, hotels and other commercial businesses dealing with General Dynamics.

Scott Hazel's Wide Aviation Knowledge Aids San Diego Museum By Julie C. Andrews

A walk with Scott Hazel through the World War I exhibit room of the San Diego Aerospace Museum is a lesson in aviation history.

Hazel, a senior software engineer at Data Systems Division-Western Center, has acquired a wealth of knowledge on the markings of these vintage airplanes, whose pilots often painted them with colorful, personal designs. He also is well versed on the rest of the museum's extensive collection.

Hazel began acquiring his expertise by building model airplanes. "Through my dad, I got interested in model building and eventually got involved with the International Plastic Modelers Society," Hazel said. "The members of IPMS stress putting the correct finishes on models. They carry model-building beyond a hobby to an art form."

Since 1984, Hazel has been a volunteer in the museum archives, where he researches requests for information on old aircraft. He also helps to make valuable connections between museum restorers and IPMS acquaintances who can provide accurate details about paint colors and other markings on one-of-a-kind airplanes.

"From the airplane restorers to the people who conduct visitors through the museum to the people like Scott who work in the archives, this museum runs on volunteer help," said George Welsh, Museum Assistant Archivist and Aircraft Restorer. "Scott is one of our volunteers whose expertise outside the museum is particularly valuable. With his knowledge of aviation and close ties to the IPMS and his own personal materials, he can help multiply the information available to us and to the museum users."

For example, the F-4 Phantom that Navy ace Randy Cunningham flew in Vietnam is undergoing restoration for a new "Fly Navy—Vietnam" exhibit. Restorers had little reference on the plane's markings until Hazel put the museum in touch with several modeler acquaintances.

"Modelers are extremely precise in detail," said Welsh. "If someone is restoring an airplane, chances are someone else in the world has built a model of it. Since we pride ourselves on accuracy, we call on that network of people."

Hazel calls the museum's World War II Japanese Zero "second to none" because of the meticulous attention to the right colors. Restorers retrieved paint chips from the old airplane and matched the color.



Restored Warbird. Scott Hazel points out that the colorful markings of the German Albatros D.Va were the personal design of its pilot, Lt. Hans Joachim von Hipple. The Albatros is on display in the World War I room of the San Diego Aerospace Museum.

IPMS members were called upon to supply display models after the museum suffered a fire in 1978 that destroyed all the showcase models. The San Diego Chapter of IPMS quickly filled 20 cases with models. Hazel's Messerschmitt Bf-109G-14/AS and F4U-1D Corsair models are part of the display.

The rebirth of the museum after the fire was due largely to volunteers and supporters worldwide whose donations helped to replenish the museum's collection. Hazel continues to look for information for the museum archives and encourages people who have aviation memorabilia to donate it or share it with the museum. The museum will copy old photographs or documents if the owner does not wish to make an outright donation.

Often, Hazel said, people do not know the value of an

object they may possess. "A friend of mine found an autographed copy of World War I pilot Billy Bishop's autobiography at a garage sale. He bought it for several dollars and it is now on display at the museum in a case devoted to Billy Bishop," he said.

Hazel is particularly interested in the Convair XFY-I Pogo and XF2Y-I Sea Dart and has answered a dozen requests for information on these two airplanes in the last year from writers or modelers.

The San Diego Aerospace Museum was the first aviation museum in the nation to receive full accreditation from the American Association of Museums — a process that included a close examination of all museum activity including preservations, research, public display and education.

Camden Operations Employees Earn College Degrees On-Site By Susan Schaefer

For several years, earning a bachelor's degree remained only a dream for Q. P. "Skip" Yerby, Group Engineer at Pomona's Camden Operations.

Yerby was forced to discontinue his education because either his home was too remote from universities offering courses in his major or his transient Air Force career made it impossible for him to settle down long enough in one spot to further his studies.

When the Camden Training department found a university that would offer an on-site, bachelor of science degree program specifically tailored to the technological needs of modern industry, Yerby made use of the opportunity.

Yerby and 28 other Camden employees are among 43 graduates of the Industrial Technology degree program established at the Camden facility by Southern Illinois University at Carbondale.

Students are required to attend weekend classes for 16 hours every other weekend to earn credits in their major. Some students attend a local junior college during the

week if other classes are needed in addition to the major to complete the degree.

"We learned state-of-the-art technology that I can use in my work, such as computer-aided design, computeraided manufacturing, material requirements planning and statistical quality control techniques," he said.

Frank Mahan, Chief of Human Resources, Camden Operations, said, "General Dynamics was the key ingredient in making this opportunity available not only for our employees but for the entire community."

"Through the degree program," he said, "the needs of industry in Camden are addressed, recruiting is easier when there are more skilled people locally available with technical expertise and the skills of company employees are upgraded."

"General Dynamics needs the skills provided through this program for developing and directing the manufacture and distribution of products and services," Mahan said.

Terry Smith, Manufacturing Analyst, said she is very satisfied with the personal growth associated with the

degree program. She said she believes her recent promotion from production operator was helped by the additional skills she developed.

"I had the experience, but completing the course work in the major was definitely a plus," she said, attributing her success to broadened skills in machine utilization, statistics and computers.

Her studies took time from her family, but it was well worth the sacrifice, she said, because "already the rewards received since graduation have been substantial."

Southern Illinois University established the program and ran it through the first graduating class, but the program has been transferred to Southern Arkansas University at Magnolia and will be taught at the SAU Tech campus in Camden.

(Susan Schaefer recently joined Pomona's Public Affairs department for a 10-week, part-time internship. She was graduated from California State University at Fullerton in January with a Bachelor of Arts degree in Journalism.)

Space Systems Planners Are Looking Far into the Future By Julie C. Andrews

While the immediate focus at Space Systems is on building Atlas launch vehicles and Centaur upper stages for military and commercial customers, a small group of planners is thinking several decades ahead.

As a result of the group's efforts, Space Systems was selected for negotiations leading to the award of a \$5.5 million, three-year "Infrastructure Study" by the National Aeronautics and Space Administration's Marshall Space Flight Center in Huntsville, Ala.

Space Systems was the sole contractor selected from eight competitors to conduct the study, which will identify the future space transportation systems needed to supplement today's Space Shuttle and expendable launch vehicles and the new technologies needed to make these systems a reality.

"This important win provides us with the opportunity to become an integral part of NASA's planning process and to identify requirements that will influence the evolution of nearly all of our products," said Dr. Alan M. Lovelace, Corporate Vice President and Space Systems General Manager.

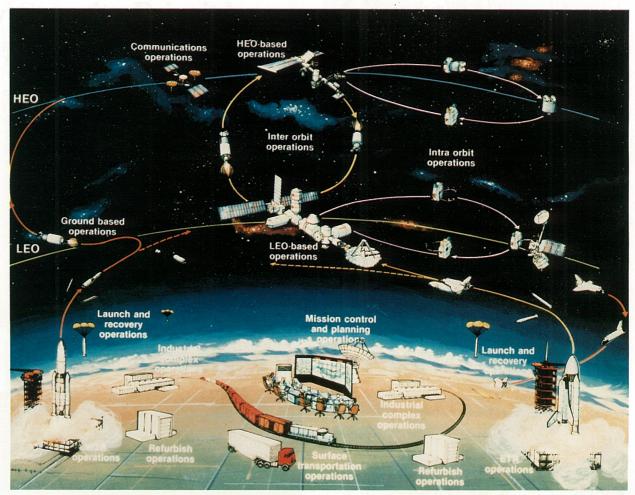
Space Systems' study approach is to examine four families of vehicles and how they relate to some generally accepted future space mission scenarios.

- Launch Vehicles. The study will look beyond the life expectancy of today's expendable rockets to consider what technologies and launch vehicles will be needed. Space Systems is already involved in the Phase II technology development and demonstration for the Advanced Launch System (ALS), which is intended to dramatically lower the cost of lifting a wider range of payloads into orbit. The Infrastructure Study will look at the ALS and a variety of other launch vehicles in the research and development stage, including the Shuttle Liquid Rocket Booster, the National Aero-Space Plane and Shuttle C, all of which involve company contracts.

- Transfer Vehicles. These are the vehicles that operate exclusively in space to move objects from one orbit to another or between orbiting platforms. The Infrastructure Study will examine the role of Space Systems' Centaur, the nation's only high-energy upper stage, as well as futuristic transfer vehicles, some of which might use nuclear propulsion

- Transportation Nodes. The Space Station Freedom, scheduled to become operational in the late 1990s, may eventually evolve from a research lab to a staging base for launching transfer vehicles to the moon and Mars. Space Systems is also studying a "gas station in space" concept to store cryogenic propellants in a separate, co-orbiting depot away from the Space Station.

- Landers and Return Vehicles. These include vehicles that return to Earth like the Space Shuttle Orbiter and vehicles that will land on the moon or other planets.



Space Portrayal. Artist's illustration depicts the complex interrelationships of future space transportation elements. In the illustration, HEO refers to high earth orbit, and LEO refers to low earth orbit.

Space Systems organized this four-family approach to allow flexibility in designing the elements needed to fit the four generally accepted scenarios for future space exploration. They are: (1) to focus on Earth, concentrating on orbiting satellites with practical benefits for communication and weather forecasting; (2) to return to the moon and build scientific observatories; (3) to mount a manned mission to Mars, either directly to the planet or first to its moon Phobos; and (4) to return to the moon to establish a lunar base and then go to Mars.

The study will be heavily computer-based with networks linking Space Systems' San Diego and Huntsville facilities with Marshall Space Flight Center and potentially other NASA centers as well. The study team will keep track of up to several dozen parallel studies and hardware development programs through shared data.

"A lot of the decisions in any of these scenarios have ripple effects on other areas," said Michael C. Simon, Manager-Infrastructure Study. "We need to study the various combinations of vehicles that will be required, when they will be needed and how much they will cost so that NASA will be prepared when the decision-making time comes. The study also includes the military, but the emphasis is on the major civilian space goals and how the military requirements will affect all the options."

Simon estimated that the direction of American space policy may not be made until the last year or two of the new administration. Were it not for the ability to share data and feed back information to all participants in the study and other contractors, the study results could be quickly out of date in a dynamic world.

During Storms, Amateur Radio Operators Go Where the Turmoil Is By Joe Stout

When the Fort Worth area experiences severe weather — high winds, heavy rain, hail or tornado conditions — more than 30 General Dynamics employees jump into their cars and go to the middle of the atmospheric turmoil.

They are members of the Radio Amateur Civil Emergency Service (RACES), a network of amateur radio operators or "hams" who assist the local fire department, National Weather Service and electronic news media in keeping the public notified of potential dangers.

The company provides special Community Relations charge accounts for them to perform these services during normal work hours, if the need ever arises.

RACES member Harold D. Reasoner, an engineering specialist in the division's Antenna Systems group, described what happens during a typical storm: hams immediately go to the National Weather Service office, radio and television studios and to Carswell AFB, where they monitor weather radar screens and establish radio contact with the rest of the RACES network.

Meanwhile, dozens of other operators continually update the network with on-the-scene reports from mobile units as the storm runs its course. "The radio traffic gets very busy and usually occupies two or three different channels," Reasoner said. "It's instantaneous communication, providing minute-by-minute information on storm movements."

Since tornados pose the greatest storm danger in north Texas, RACES members are required to attend an annual 12-hour Weather Service course in tornado spotting, said C. W. "Bill" Penny, an engineering specialist in the Electronics Testing group.

Penny also works closely with the local Red Cross in providing communications in times of disasters. He assisted with communications needs for the Mexico City earthquake in 1987, Hurricane Gilbert in 1988 and two airliner crashes at Dallas/Fort Worth International Airport.

Through Penny's work, the General Dynamics Recreation Association facility in Fort Worth was established as a Red Cross Disaster Center. Penny also directs the recreation association's 190-member Radio Club.

Kenneth D. Knudson, an Automatic Test Equipment engineering chief, works with the Weather Service in coordinating storm reports from other Texas counties in the RACES network. Those responsibilities took him to the local Weather Service headquarters eight times during January and early February — and tornado season doesn't start until spring.

Keith D. Pugh, lead engineer in Fort Worth's Threat Warning group, has been a ham about 35 years. In addition to the emergency service, he and other RACES operators provide communications at annual community events, including the March of Dimes TeamWalk and Cowtown Marathon.

"It's all done on a volunteer basis, and we use these events as training for our duties in times of disaster," he said.

Pugh said RACES members get much satisfaction from their work with the Weather Service. "It can be exciting, but it's mainly rewarding to know that you're doing some good for somebody," he said.



Civil Emergency Communicators. Fort Worth employees Kenneth D. Knudson, Keith D. Pugh, C. W. "Bill" Penny and Harold D. Reasoner (left to right) with amateur radio equipment their club maintains at Fort Worth's recreation center.

Avenel, Charleston Combine Operations With Quonset Point

Electric Boat's operations at Avenel, N.J., and Charleston, S.C., have combined with the facility at Quonset Point, R.I., and will report to William W. Bennett, Vice President and Quonset Point General Manager. The Avenel and Charleston locations employ nearly 900 people. Quonset Point has 4,800 employees.

In making the announcement, James E. Turner Jr., Vice President and Electric Boat General Manager, said, "As Electric Boat moves into 1989, changing business opportunities, increased competition and developing technologies require changes to our organizational structure and management responsibilities."

Turner said the changes were made "to ensure simplified decision-making and more effective management actions."

The Charleston facility was once used to build large aluminum spheres to contain liquid natural gas on tankers built by the Quincy Shipbuilding Division. The facility was closed in January 1982 and was reopened in January 1987 as a steel fabrication facility to support Electric Boat's submarine construction programs at Quonset Point and at the shipyard in Groton, Conn.

Electro-Dynamic, located at Avenel, manufactures shipboard electrical rotating machinery, electrical and electronic equipment and special subassembly fittings and pipe hangers.

Tank Gets Cleaning And Fire Trainees Get Some Practice

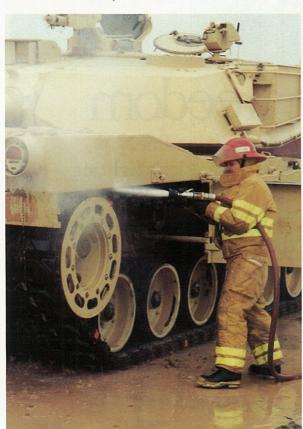
Land Systems and the Sterling Heights, Mich., Fire Department recently worked together in a project that meshed fire training and tank cleaning.

Richard M. Bailey, a supervisor in the Land Systems Prototype Shop, faced a problem with a tank that had become heavily caked with packed mud from an overseas demonstration. The tank was operational, but the mud prevented service on the suspension.

Bailey said the tank-washing equipment could have cleared away the mud, "but it would have taken about three days. We needed some equipment that would provide higher water pressure than we had available."

At Bailey's request, Land Systems Fire Protection Chief Samuel R. Moore contacted the fire chief of the Sterling Heights Fire Department. The chief said he had a training crew on hand and that the trainees could always use practice with high pressure hoses.

"They handled those hoses pretty well," Bailey said. "In about 45 minutes they had the tank cleared of the mud."



A Good Cleaning. A Sterling Heights, Mich., Fire Department trainee directs water under high pressure to clean the mud from an M1A1 tank at the Land Systems Central Office Complex. The trainees got 45 minutes of practice with the high pressure equipment and saved Land Systems about three days of tank-cleaning effort using its own equipment.





Dubai Highlights. Scores of defense companies from throughout the Free World, including Fort Worth and Land Systems, gathered in Dubai in February to demonstrate some of their products at what promises to be a biennial air show in the United Arab Emirates. One of the daily features of the five-day show was a flight demonstration by a Fort Worth-designed and Turkish-built F-16C. (Top photo) On hand to explain the flight characteristics of the Fighting Falcon were Test Pilot Bland Smith (in blue flight suit) and Neil R. Anderson, Fort Worth's Market Development Director (speaking to visitor in burnoose). Also representing General Dynamics (in bottom photo) was Dain Hancock, Fort Worth Division Vice President—Program Development (center, speaking to military officers).

Electric Boat's Career Development Program Is an Innovative Way to Strengthen the Division

David L. Stepler, Engineering Supervisor . . . John P. Casey, Ships Management Manager . . . Tracey T. Coveyou, Site Construction Superintendent.

What do these Electric Boat Division employees have in common besides their important positions in the company?

All are graduates of Electric Boat's Career Development Program, a system established in 1978 as an innovative way to strengthen the division.

Applicants are recruited from more than 40 colleges, with the heaviest recruiting taking place at maritime schools such as the Massachusetts Maritime Academy, Maine Maritime Academy and U.S. Merchant Marine Academy. A bachelor's degree is required and most applicants are engineering graduates.

In setting up the development program, Electric Boat's Operations Management Team wanted a mix of trade experience and technical knowledge within its management structure. The program's objective was to build a team knowledgeable of the skills required to construct submarines, technically sophisticated enough to understand engineering management and systems and creative enough to keep pace with changing technology.

All three objectives have been successfully met, according to Cheryl J. Stergio, Career Development Administrator in the division's Management Development and Training area.

More graduates: Peter J. Halvordson, Production Control Manager . . . Bruce M. Hart, Superintendent . . . Monson S. Lane, Assistant Superintendent.

"The importance of this program to Electric Boat is reflected in the involvement on the part of upper management in program development, implementation and ongoing evaluation," Stergio said.

Thousands of resumes are screened each year and close to 100 prospects are brought to the division's Assessment Center. The center simulates job-related situations to analyze the applicant's ability to perceive and handle problems and to organize and plan solutions.

"Applicants are given one hour to study the background of workers and jobs that they will be confronted by," Stergio said. "Then, for 45 minutes, they're shown no mercy. In a given situation, a group of Electric Boat employees, who have been trained to act out their sce-

narios, storm into the applicant's session, carrying on in a noisy manner and demanding immediate resolutions to their problems."

"These candidates aren't judged according to right or wrong answers," Stergio said, "but rather on how well they can handle developing crises."

Also graduating: Robert D. Navin, Superintendent . . . Charles C. Nixon, Operations Staff Specialist . . . James M. Noonan, Quality Chief . . . James S. Smith, Engineering Chief.

An hour-long leadership group discussion follows, during which a team of applicants tries to solve a construction problem. The applicants are rated on leadership qualities, perception and analysis, organization and planning, decisiveness, judgment, interpersonal competence, oral and written communications, energy level and management of stress and pressure.

Approximately half of the applicants interviewed in 1988 were accepted and half of those actually entered the program, which is a three-phase, two-year process.

Phase I lasts seven months, when employees learn about the division, trade expertise and human resources.

Phase II involves three six-month supervisory rotation assignments. These on-the-job-training experiences differ, depending on departmental management style, manning curves, schedules and skills of the tradesmen being supervised. This phase gives participants an overview of the shipbuilding process as well as detailed day-to-day construction technique. Assignments can be within four broad trade areas — steel, installation, shipwrights and piping.

Additional graduates: John A. Stringer, Manufacturing Manager/Quonset Point . . . Scott C. Waring, Operations Staff Specialist . . . Dean C. Wilcox, Welding Engineering Manager/Quonset Point.

In Phase III, participants receive permanent assignments as first-line supervisors.

"The purpose of the Career Development Program is to induce new management talent into the shipyard management organization, new talent with a technical background," said Curtis B. Shellman Jr., Electric Boat Vice President—Operations. "Promotions, however, are not automatic. They must be earned. The biggest factor is the individual's performance."

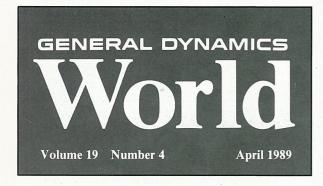


Forty-five years ago, our freedom was on the line. On the front line. And on the production line. Because in Europe and the Pacific, America's fighting

forces needed a new, longer-range heavy bomber. And on our assembly lines in Ft. Worth and San Diego, and on others across the country, America's working forces responded. At peak production in Ft. Worth, more than 30,000 workers, toiling around the clock, were building a new B-24 every four hours.

Now we are helping to build one more. By making a grant to help restore one of our original B-24s to its original condition. Soon a B-24 Liberator, which first flew in the Pacific, will fly again, this time in air shows around the USA.

Not as a symbol of American military might. Or of American manufacturing muscle. But of the American spirit which makes **GENERAL DYNAMICS** them both possible. A Strong Company For A Strong Country



F-16 Supplier Wins Small Disadvantaged Business Award

Fort Worth recently presented an award to Velbros Engineering of South El Monte, Calif., as the division's Outstanding Small Disadvantaged Business Supplier.

George Velasquez, President of the firm and one of its four engineers, described his attitude about quality during a brief awards ceremony: "I sleep good at night because I know the parts we manufacture for the F-16 are quality parts."

"It's also important that the paperwork be correct and that parts get out the door on time," added his brother Adrian Velasquez, the firm's Vice President and Administrative Officer.

Linda S. Holloway, the Fort Worth buyer who deals with the company, said Velbros Engineering has been extremely responsive to requests to expedite orders to prevent potential shortages on the production line. This accelerated delivery has been accomplished at no additional costs, she said.

Velbros has seven employees, including three brothers. It was founded by the Velasquezes' father.

Lewon D. Simpson, Division Vice President-Material at Fort Worth, said the performance of Velbros shows that the company is keenly aware of the importance of quality.

Velbros Engineering provides machined structural parts for the F-16 airframe.



Outstanding Small Supplier. Fort Worth buyer Linda Holloway (center) with Adrian Velasquez (left) and George Velasquez of Velbros Engineering, which was named the division's Outstanding Small Disadvantaged Business Supplier for performance in 1988.



ADF Test Flight. One of seven F-16s used in the Air Defense Fighter flight test program carries Sparrow missiles under its wings on a mission from Edwards AFB, Calif. Kingsley Field, Ore., recently took delivery of the first ADF-modified aircraft to enter Air National Guard service.

Significant Progress Is Reported in USAF Fighting Falcon Air Defense Program By Joe Stout

Significant progress has been made in the F-16 Air Defense Fighter (ADF) program, including the recent delivery of the first ADF-modified F-16 by the U.S. Air Force's Ogden Air Logistics Center in Utah.

The Air Force selected a modified version of the F-16A/B as its new Air Defense Fighter in October 1986 after competing the F-16 against Northrop's F-20. A total of 270 aircraft will be modified and assigned to 11 Air National Guard interceptor squadrons responsible for air defense of the continental United States.

The ADF modification kits are being produced by Fort Worth and installed in the designated aircraft at Ogden's F-16 depot together with another retrofit program, the F-16A/B Operational Capabilities Upgrade (OCU). The aircraft are supplied from bases where the Air Force is replacing them with F-16Cs.

The first aircraft, a two-place F-16B, has been delivered to Kingsley Field, Ore., for pilot training. ADF aircraft maintenance training began at Kingsley in late 1988.

F-16 ADF modifications include radar upgrades to enhance detection of small targets, a high frequency radio for longer-range communications, an advanced identification friend or foe interrogator module and antenna set, a night identification light and Global Positioning System provisions, in addition to capability to carry and launch AIM-7 Sparrow beyond-visual-range missiles.

The OCU enhancements include APG-66 radar software updates, provisions for the AIM-120 Advanced Medium Range Air-to-Air Missile and expanded avionics computer capacity. Other OCU capabilities are adapted from F-16C/D aircraft.

Seven F-l6s assigned to the F-l6 Combined Test Force at Edwards AFB, Calif., and the 57th Fighter Weapons Wing at Nellis AFB, Nev., are participating in the ADF flight test program, which has included several AIM-7 missile launches. Flight tests will continue throughout the year.

The ADF aircraft are scheduled to become operational in mid-1989 with a Fresno, Calif., Air National Guard unit.

The Air National Guard has already begun flying standard versions of the F-16A in air defense squadrons at Jacksonville, Fla., Great Falls, Mont., and Atlantic City, N.J., where the Fighting Falcons replaced F-106 interceptors, and at Burlington, Vt. Additional bases will convert from F-4s to F-16s as the ADF-modified aircraft go into service.

Fort Worth delivered an F-16 avionics familiarization trainer to Kingsley Field in March and will also supply the ADF bases with cockpit procedures trainers for pilot training.

Land Systems Launches Egyptian Coproduction of M1A1 Tank By Donald L. Gilleland

The Department of Defense on April 3rd awarded a \$12.5 million contract to Land Systems for manufacturing technical assistance (MTA) to support the coproduction of 555 M1A1 tanks in Egypt.

"This contract is very important to us," said Robert W. Truxell, Vice President and Land Systems General Manager. "It signals the beginning of a coproduction effort that will eventually be worth \$1.2 billion to us over the next 10 years."

The effort initially will support the first two production increments of a planned six-step program extending to 1998. The first increment involves the manufacture and assembly of M1A1 tank components and subassemblies in the United States for shipment to Egypt, where they will be used for an Egyptian coproduction tank assembly process.

In 1984, Egypt embarked on a long-term program to standardize and modernize its main battle tanks. In 1987, after an extensive review of the U.S. Army's M1A1 Abrams tank, British Challenger, French AMX-40, Brazilian Osorio and a modern Soviet tank, the Egyptian Army recommended the Abrams.

Last Nov. 1st, representatives from the United States

and Egypt signed a memorandum of understanding establishing a program to coproduce M1A1s in Egypt. The 10-year program, which was approved by the U.S. Congress and is supported by the U.S. Army and the United Automobile, Aerospace and Agricultural Implement Workers of America, represents the first international sale of the Abrams.

The program consists of six phases covering the period of 1987-1996. The first increments began with award of the MTA contract to help Egypt establish a tank assembly

The first 15 M1A1s will be fully produced in the United States and shipped to Egypt to train Egyptian personnel on tank assembly and support. The Egyptians will then begin assembling tanks from components and assemblies made in America.

Over time, Egypt will build limited numbers of highusage components; however, it will not produce components containing critical or classified technologies.

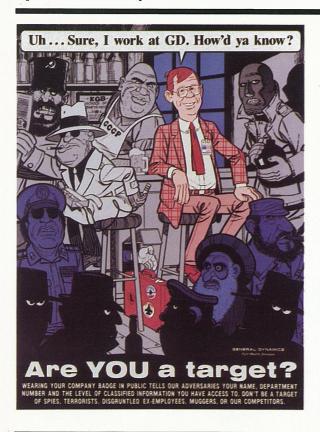
Eventually the Egyptians will have the capability to produce up to 100 tanks per year. However, approximately 81 percent of the work for the 555 tanks will be retained in the United States. The program will generate at least \$1.2

billion in direct and indirect income for the American economy and create a minimum of 52,000 man-years of employment in the United States during 1990-1996 when tank production for the United States is scheduled to be greatly reduced.

The benefits to the U.S. Army in terms of recoupment and rental fees will be approximately \$173 million, plus significant cost savings to the U.S. Army tank program as a result of increased procurement quantities for the Egyptian program. The Egyptian tank program will also generate about \$405.3 million in gross tax revenues for national, state and local governments.

Significantly, the benefits for the United States extend beyond revenue and employment. The program supports a strong and stable ally in a highly volatile region, keeps the M1A1 line operating at an efficient rate and establishes a logistics support network that could be important for any future Abrams deployments in the Middle East.

Egypt will not build tanks for the U.S. Army and will be restricted from selling any tanks assembled in Egypt to third countries without the express prior approval of the U.S. Government.



Eleven Employees Win Pomona Awards For Excellence

Eleven Pomona employees recently received Awards for Excellence, the highest honor given by the division for outstanding service in a particular field.

Pomona winners were Becky Hartkopf, administration; Dr. Yung-Koh Yin, engineering; Denny Beroiz, management; Troy Moore, material; Karl Doerner, production; Scott Harbison, quality; and Sandy Shea, special award for coaching.

At the division's Camden Operations, awards went to Barry Cole, production; James Burnside, production; and Edgar Parker and Deborah Gage, administration.

Criteria for the Excellence Award include outstanding performance in one of seven selected categories such as production, administration, engineering or management; acceptance by peers and fellow workers; company dedication and professional involvement and contributions to meeting the goals of the division.

The winners were recognized by General Manager Sterling V. Starr at the annual "State of the Division" programs at Pomona and Camden.

Inspector Develops Convenient Device For Quality Assurance

An inspector from Land Systems' Sterling Plant has invented a device that helps assemblers keep quality in the M1 driver's instrument panel as they build it.

The invention grew out of the concern by Matthew R. Walters over the failure of a selector switch, and the resultant rework, when the instrument panel was tested late in the production process.

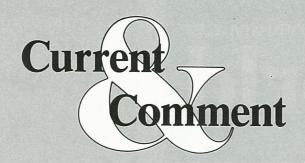
Walters, on his own time, constructed an in-process, battery-operated device that energized the fuel meter and selector switch. This allows the assembler to test the switch as it is assembled and replace it immediately when it proves defective.

Walters demonstrated the device to Cass J. Miciuda, Manager—Quality Assurance at Sterling, who recognized the potential not only for early detection but for significant reduction in reinspection and rework time.

Using Walters' design, Quality Engineering constructed a convenient connector device to be used by Production personnel to ensure that the switch problem is corrected before submission to inspection. Four devices were built for use by Production until a more reliable switch can be found.

Air Force Saved \$117 Million

The U.S. Air Force has saved more than \$117 million as the result of more than 52 Value Engineering Change Proposals submitted by Fort Worth since the beginning of the F-16 program. About 3,500 Fort Worth employees have been trained in Value Engineering techniques.



By Herbert F. Rogers President and Chief Operating Officer

General Dynamics became involved in developing an advanced new Japanese fighter known as the FS-X after the U.S. Government convinced the Japanese not to design and manufacture the aircraft alone.

Since then, a debate has arisen in the United States on handling international programs when the U.S. Government decides to share military technology with our allies, resulting in potential conflicts between security and economic factors. While this debate is both timely and healthy, it is unfortunate that the F-16-based FS-X project has become the focus, because the FS-X agreement that was hammered out over the past two years actually serves both the military and the economic interests of America. It is beneficial to American security interests, to American industrial interests, to American economic interests and to the interests of the company and its employees.

Why did General Dynamics agree (at the U.S. Government's request) to participate? Wouldn't the company prefer to sell its F-16s off the shelf to Japan? Why, as the critics allege, is the company "giving away" precious technology and know-how and getting little if anything in return?

Answers to the latter two questions help provide a reply to the first:

- Of course the company would rather sell its airplanes directly. But that never was likely in this case. Japan's original intention was to develop a new aircraft alone.
- There is no reasonable basis for calling the FS-X agreement an American giveaway. Japan will spend approximately \$500 million with American industry in development and a probable \$2 billion to \$3 billion in production. The Japanese will obtain existing F-16 data, subject to strict U.S. controls. At the same time, American engineers will obtain firsthand access to and participation in important new Japanese developments.

While critics claim the FS-X program threatens American commercial aircraft products, the two major American commercial aircraft companies support the concept of the FS-X agreement. Indeed, they have been involved in or are seeking partnerships of their own with the Japanese, and due in part to this, the Japanese are among their best customers.

This contrasts with Europe, which houses the most vigorous competitors of American commercial and military aircraft companies — competitors yearning to initiate their own partnerships with Japan and quite anxious to supplant the United States on the FS-X.

The FS-X agreement is good for American industry because:

- The flowback of several billion dollars to the United States through the FS-X program which will not occur if Japan goes it alone will help reduce America's trade deficit with Japan.
- Despite the doubts of skeptics, Japan indeed has something to offer in new advanced composite and avionics technologies. The F-16 technologies that would go to Japan range from current to past. General Dynamics and other American manufacturers already are at work on new technologies and new fighter aircraft.
- It is a fact of life that international sales of American products whether sophisticated fighter planes or lesser forms of manufacturing require partnerships or other cooperative arrangements with purchasing countries. This has been the case with the F-16 since the mid-1970s. Many large U.S. corporations have longrange strategic plans that target the international marketplace. In so doing, strategic alliances with foreign companies are a fundamental part of that strategy.

The debates on the FS-X program do not warrant uprooting an agreement that has been reached in good faith by two governments that are allies, not enemies, and by industrial corporations on behalf of those governments.

Pace Discusses Company and Industry Issues

In a recent interview with the editors of *Defense Daily*, General Dynamics Chairman and Chief Executive Officer Stanley C. Pace addressed issues affecting the company and the defense industry. Following are condensed excerpts from Pace's comments.

The prospects for the company and for its stock in the near future:

"I think we entered this period with a very strong, diversified mix within the defense industry and a better mix than most of our peers. We're serving key programs in the Army, Navy and Air Force — programs that are vital to each of these services and which we think are less susceptible to cuts, certainly less susceptible to deep cuts and even less susceptible to elimination than many other programs.

"As far as our stock is concerned, I don't think there will be a lot of movement one way or the other in the immediate future. The stock should be appreciating in a couple of years. If we're successful in meeting the performance projections and cost projections in our new business, then I think we've got a terrific company and an effective business in the eyes of Wall Street."

The company's investment in research and development and new business:

"We have been increasing our research and development effort in the last several years. We think this is a nervous time but also a vital time to place your bets and win some business. We're doing that and we're doing it on a selective basis. We placed our bets on the A-12, and that won out. We placed our bets on the Atlas program for the ELVs, on the SINCGARS radio, on the Advanced Tactical Fighter and on the Seawolf submarine, as examples."

The vulnerability of General Dynamics programs in the current budget environment:

"We don't see a lot of vulnerability. I think we're in the heartland of what DOD wants and what Congress is willing to approve. The F-16 is a very strong program. There's some planned reduction in our (M1) tank program,

but we've got a multiyear contract coming up, so I think we're going to be in a relatively strong position there. With regard to submarines and the increasing technical threat that the Soviets have, this is an area that will have to continue to improve and build and replace. With regard to missiles such as Tomahawk, Standard and the Stinger, we're having second sources on those, (but) from a programmatic basis, all those are in very good shape."

The impact of the European Community's 1992 initiative on the U.S. defense industry:

"I think it will have a larger impact on the U.S. commercial business because there's a lot of trade back and forth that is won or lost in the marketplace. With the defense part of aerospace, today it takes a government-to-government agreement, and after 1992 it will still take a government-to-government agreement if we have a fighter or missile or weapon system that the Europeans want. (However), the 1992 plan, with the increasing mutual arrangement of the European countries, could very well cause them to more judiciously select who's going to do what within their countries. Therefore, they might become more effective both cost-wise and technically and be stronger competitors."

The current investigations of defense procurement practices and changes that could be implemented in the process:

"We're very pleased we're not involved in the Ill Wind investigation, and we think in part that it is because of the (ethics) program we established a few years ago.

"What changes can be made? I don't think there's a single over-arching solution. It's a myriad of minor issues that have to be addressed. These issues are not solely in the industry, in DOD or in Congress, but they're in all three. We have to address them in each of the three areas and in the interrelationship of the three. I would like to see us go from the finger-pointing process, which is not solution-oriented, to a mutuality-of-effort process, which would be solution-oriented.



Toys for Tots Honor. U.S. Marine Corps Gunnery Sgt. Kenneth Kreft presents a plaque to George Milicic, Land Systems Warren Logistics Center, for his contribution to the Marine Corps' Toys for Tots program.

Employee Honored For His Contribution To Toys for Tots

The U.S. Marine Corps recently honored a Land Systems logistics planning specialist for his contribution to the Toys for Tots program.

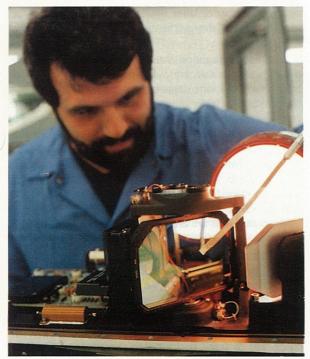
George Milicic, Support Services, received a plaque from the Marines in ceremonies held at the Warren Logistics Center for his efforts in helping the Marine Corps give toys at Christmas to disadvantaged children.

Milicic, a World War II Marine, introduced the Toys for Tots program to Land Systems at the Warren Logistics Center in 1985. He was instrumental in expanding it in 1988 to General Dynamics facilities in the Detroit area that included both Land Systems and General Dynamics Services Company.

In 1989, two truckloads of toys were turned over to the Marines as a result of Milicic's efforts and the generosity of Detroit-area General Dynamics employees.

Land Systems in Competition

Land Systems is teaming with a West German firm to compete for a \$1 billion contract that will provide the U.S. Army with a nuclear, biological and chemical reconnaissance vehicle. Land Systems has joined with Thyssen Henschel in competition with TRW's Systems Engineering Division that is using a vehicle from General Motors of Canada as its entry. The Army will select a winner by the end of September.



General Dynamics Uses Controlled Environment for Subassembly Clean-up. James J. Zbytowski, Mechanical Assembler in the Clean Room at Land Systems, uses a cleaning wand with special cleansing tissue to remove smudges from the optical glass on the Azimuth Drive, a subassembly of the Gunner's Primary Sight (GPS) on the Abrams M1A1 tank. Laser beams from the GPS pass through the laser mirror (right foreground) and optical glass, then out to the target. When the beams return, they are converted into actual target distance and displayed in the tank computer system.

Survey Focus Groups to Begin Work in May

(This is another in a series of columns that will appear in General Dynamics World in the months before and after the survey of employees this fall.)

The next stage of preparation for the survey begins in May with a team effort of survey managers and randomly selected employees.

A task group of three survey managers will conduct focus groups with employees. A focus group consists of 10-15 randomly selected employees, usually from the same work area or department, who are asked their opinions of their division's strengths and weak-

nesses. As with the 1986 survey, the information from these groups will help identify issues for the approximately 75 questions that will form the corporatewide section of the survey questionnaire.

One of the three task force members will travel to each of the divisions in that manager's geographic region to meet with focus groups. Employees picked for the groups will be notified of the time and location of the sessions by their division survey managers.

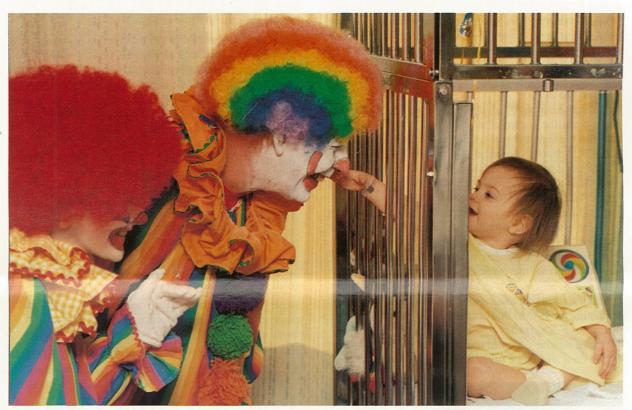
Although participation is voluntary, survey man-

agers urge selected employees to attend and to be completely candid. The groups will meet for one to two hours. General information will be gathered anonymously and kept on charts that all participants can see during the meeting. The charts are viewed and used only by the survey manager task force and an outside consultant.

Consultants conducted these group meetings for the 1986 survey. Experience from that survey is allowing the company to take a bigger role in preparing the second survey. That's why the corporatewide task force has been formed for May's groups. Using survey managers rather than consultants also reduces costs, although consultants will attend some of the group meetings to get a feel for current issues.

Employees will take part in other survey activities during May. Some division survey managers will conduct their own group sessions with employees to obtain suggestions for the division-unique questions in the survey. Meetings will also be held with union and management representatives to obtain their input.

The theme of all these efforts is participation. The company is seeking help from all segments of the work force to make this survey as accurate and as useful as possible.



Clowning Around. Recovering from pneumonia and too young for candy treats, this tiny tot at St. John Hospital in Detroit, Mich., settles for the big red nose on clown James E. McCarthy. McCarthy, Drafting Supervisor at Land Systems, and his partner, Paulette A. Check, Tank Programs Representative, tour annually with costumed Land Systems Management Club members to area hospitals and nursing homes.

Our Commitments

- To our customers we will be attentive and strive to maximize the value, quality and operability of General Dynamics products and services within the requirements of our contracts.
- To our suppliers we will be the best customer we can be and will emphasize both fair competition and long-lasting relationships.
- To the many communities of which we are a member, and to society as a whole, we will act as responsible and responsive corporate citizens and in a moral, ethical and beneficial manner.
- To our shareholders we will pursue our growth and earnings objectives while always keeping ethical standards at the forefront of our activities.
- To each other, as employees, we will treat one another fairly and with the dignity and respect due all human beings.

These commitments are the heart of the Ethics Program at General Dynamics. Our goal is to abide by the highest standards of business ethics and conduct.

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Saudi Ambassador Visits Fort Worth For F-16 Briefings

His Royal Highness Prince Bandar bin Sultan, Saudi Arabian ambassador to the United States, visited Fort Worth recently for F-16 briefings and a demonstration flight in the front cockpit of a two-seat Fighting Falcon.

Prince Bandar served as a fighter pilot in the Saudi Arabian Air Force for 17 years before becoming ambassador in Washington, D.C., in 1983. He is a graduate of Cranwell Military College in England and holds a master's degree in International Relations from Johns Hopkins University.

He met with company and union officials at the division and addressed several hundred Fort Worth employees, representing every department of the division, on issues involving his nation and others in the Middle East.

In his introduction, Herbert F. Rogers, General Dynamics President and Chief Operating Officer, said that the ambassador has played a key role in negotiating peace agreements in the Middle East and has "worked long and hard for peace and stability in his part of the world."

Prince Bandar spoke of the relationship that has existed between his country and the United States over the last 50 years, emphasizing that Americans have played an important part in the development of Saudi Arabia, especially during the last two decades.

Saudi Arabia's abundant petroleum resources have allowed the nation to greatly increase the standard of living of its people while supporting a strong defense, he said. "Defending a secure source of one third of the world's oil reserves is an imperative that requires advanced weapons systems," he said.

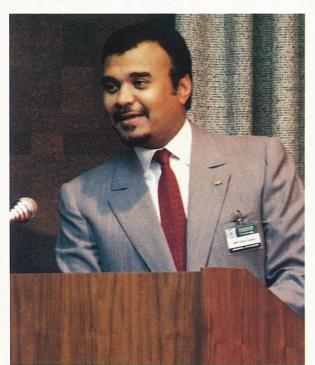
He said his nation "always opts to fulfill its (defense) needs from the United States" because of the long relationship between the two countries and the Saudis' belief that U.S. weapons systems are the best in the world.

U.S. policies that have hindered sales of advanced aircraft to his nation in recent years have been regrettable for Saudi Arabia, Prince Bandar said. "These (policy) fights are draining and distracting . . . and divert our attention from the peace process, where we should be putting our energies," he said.

He expressed hope that such sales will be approved, both to improve the defense of his nation and for the economic benefit of U.S. industry.

Saudi Arabia is considering an M1 tank purchase and is discussing the F-16 as one of several alternatives to replace its fleet of F-5 aircraft.

Prince Bandar occupied the command cockpit of a new F-16D on a 50-minute orientation and evaluation flight.



Saudi Visitor. Prince Bandar bin Sultan, Saudi Arabian ambassador to the United States, speaks to Fort Worth employees.



Pierre Laclede Center, St. Louis, Mo. 63105

Manager of Internal Communication: Edward D. Williams

Contributors: Julie Andrews, Graham Gavert, Don Gilleland, Myron Holtzman, Dean Humphrey, Jack Isabel, Dave Lange, Jerry Littman, Jack Price, Tom Rule, Chris Schildz, Joe Stout, Joe Thornton



MD-11 Fuselage Sections Are Loaded on an Oceangoing Barge for Delivery to Long Beach, Calif.

Airliner Fuselages Are Shipped by Convair By Barge in 100-Mile Ocean Voyage By Julie C. Andrews

Getting the Convair-built MD-II airliner fuselages from San Diego to the Douglas Aircraft plant in Long Beach, Calif., requires operating through two middle-of-the-night time windows, a 100-mile ocean voyage and good weather.

The 147-foot-long fuselage is shipped in three large sections and two smaller sections. When assembly is complete at Convair, the sections are loaded on four special transporters that take them to the company's facility on San Diego Bay, where they are placed on an oceangoing barge for the trip up the coast to Long Beach.

The route to the harbor from Convair's Lindbergh Field Plant lies straight across the runways of the San Diego Airport, and the trek can only be made during the airport's curfew on operations between midnight and 6 a.m. When the time comes to cross the runway, the Convair Fire Department radios the airport tower for clearance in case an airplane is making an unscheduled landing.

About dawn, the fuselage sections are loaded on the barge with ramp and winch assembly. A 1,200-hp tug designed to withstand ocean winds and waves tows the barge to Long Beach Harbor, a 12- to 14-hour trip depending on the weather. The trip is postponed if there are

storms or high seas.

The fuselage sections are unloaded at Long Beach Harbor. However, the five-mile trip through the streets of Long Beach to the Douglas plant also can only be made between midnight and 6 a.m. A tractor is attached to each of the transporters, lead and trailing guide cars turn on flashing lights and the convoy begins its trip. Along the way, transportation crews must delicately lift the high-tension wires and avoid overhead traffic signals, generally by driving on the wrong side of the road.

The trip takes about $1\frac{1}{2}$ hours, and the fuselage sections usually arrive at the Douglas plant gates between 4 and 5 a.m. For safety purposes, the trip through Long Beach is not made on Friday or Saturday nights, nor is it made if it is raining.

This year, 10 shipsets of fuselages will be delivered, and 50 shipsets per year are expected to be delivered at peak production. Convair recently signed an agreement with McDonnell Douglas for production of MD-11 fuselages that is expected to extend beyond the year 2000. McDonnell Douglas has a total of 253 MD-11 orders from 27 customers.

Pomona Time Sheets Give Way to Better System In Reporting Department Labor Charges By Susan Schaefer

Pomona production managers are discarding their departments' time sheets in favor of a new time-saving, easy-to-use labor reporting system.

High-density bar code technology, used to record labor charges on-line, is being lauded as the most effective way to reduce costs and improve competitiveness.

The labor-on-line system is being used to enhance the division's Manufacturing Resource Planning (MRP II) program. Jess Bathke, division vice president and director of MRP II, said the goal of MRP II is to reduce costs and improve data accuracy and control in production. "Bar coding is essential to MRP II if we are to gain maximum effectiveness from the program," he said.

The bar coding system was developed jointly by Pomona's Operations Department and Data Systems Division's Business Systems Group.

Steven Brandon, Senior Accountant in Labor Accounting, said the use of the labor-on-line system will result in substantial cost reductions. "When the scanning system becomes fully utilized in those production departments with terminals," he said, "we could generate substantial cost savings in the first year."

While Labor Accounting is training people to fully implement the scanning system by year's end, mechanical engineers help "bring in the technology," said Timothy Jenkins of Computer Aided Manufacturing. Jenkins coordinates installation of the on-line equipment and helps personnel with the system's start-up.

"Once employees learn the scanning system," Jenkins said, "they are amazed how quick and easy it is to use." The procedure starts with the employee scanning his or her magnetized identification badge through a nearby data collection terminal. Then a wand is used to scan bar codes for cost code, cost center, operation number and job order number. The production worker keys in the quantity. Actual stop times are recorded automatically.

When appropriate, an employee may scan with one sweep a number of labor operations into the system and can also charge labor performed on multiple job orders at the same time.

Jenkins and Brandon noted that the scanning system is not only easy but accurate. For instance, during the first quarter of 1988, one department reported 57.6 hours of unaccountable labor charges using the keypunch data entry system, compared to .7 hours in the first quarter of 1989 using the on-line system.

The real-time system that collects work-in-process transactions enables supervisors to quickly isolate and verify unaccountable, invalid charges up to two weeks on-line and take steps to resolve problems and keep erroneous data out of the labor accounting system. After two weeks, labor transactions are archived for seven years.

"Before scanning, nobody knew for sure the source of unaccountable charges," Jenkins said. "The source could be keypunching errors, invalid job orders or expired accounting work orders. All we know is that when we scan labor charges, we find the errors before they become problems."

Supervisors also use the system as a real-time health check and to track performance standards and double-check labor charges, attendance and job order status.

Both "paper shuffling" and paper storage are reduced because direct data entry into the computer system is made possible through bar codes. Data retrieval and security are assured by an in-house processor. If the mainframe in San Diego goes down, the minicomputer in Pomona stores information until the host computer is operating again.

Kirk Stuessel, Manufacturing Supervisor, reported that the labor on-line system has been operating in his department for three months.

Marines, Sailors Fire Stinger and Redeye During Army Training By Jerry Littman

"Sixty seconds . . . 45 seconds . . . 10, 9, 8, 7 . . ." The countdown echoed from the control tower of the South McGregor Range at Fort Bliss, Tex., as 19 U.S. Marines and sailors prepared to conclude a six-week Stinger training class. Their final exam — to test-fire Stinger and Redeye missiles.

It was a clear morning when the students, accompanied by noncommissioned officers, arrived at the range. The group waited as other vehicles began unloading Stinger and Redeye missiles, tracking head trainers and other equipment.

Anticipation began to mount as other military personnel and civilians began to pack the nearby bleachers.

Then the orders were given. The students moved to the equipment and the tests began. Eighteen of the students fired the Redeye missiles that were manufactured at Pomona more than 20 years ago. They successfully tracked an A-7 aircraft flown by the New Mexico Air National Guard. They also successfully fired Redeye missiles at ballistic aerial targets.

The final student, Marine Pfc. Daniel Wilhelm of Gainesville, Fla., the top student in the class, fired the Valley Systems Division-produced Stinger. He had but one chance to score a hit — and he made it count.

"I wasn't as nervous as I thought I would be," Wilhelm said, adding that the support of his fellow students had helped.

The students graduated the next day as qualified Stinger gunners, each receiving a special pin from General Dynamics and a graduation certificate.

The Stinger training class was one of about 14 classes held annually at Fort Bliss for Marines and sailors. The U.S. Army also conducts 26 such classes every year for its personnel.



Becoming Stinger Gunners. Sailors and Marines prepare for final Stinger training exercise at the conclusion of their class at Fort Bliss, Tex. Fourteen classes are held annually for sailors and Marines, and upon completion of the course each qualifies as a Stinger gunner and receives a special pin from General Dynamics.

Pomona Women and Minorities Get Good Return on Career Investment

Years of experience for a modest investment — a good deal by any standard — is offered to qualified women and minority salaried employees through Pomona's Career Enhancement Program.

Since Pomona began the program in 1986, eight employees have entered the two-year division-sponsored job rotation program within their directorate. The first five graduates, Janie McMahen, Anna Pearman, Frank Robles, Jeryl Schauer and Kimberly Walz, received certificates recently from Sterling V. Starr, Vice President and Pomona General Manager.

The Career Enhancement Program has two goals: to help outstanding employees acquire knowledge and experience of the division's functions and to create an awareness of their talents within the division.

"My experience in the last two years was worth 10 years' experience in a normal career," according to Walz, human resources specialist. "Also, I was given opportunities that might never have become available."

Pearman, a staff analyst in International Business Development, was involved in marketing division products overseas. "I developed an awareness of the intricacies and subtleties of this important aspect of our marketing program," she said. "Also, I was impressed by the amount of teamwork and commitment needed to successfully carry off an international sale."

Pearman credits the program with helping her gain selfconfidence and credibility, characteristics she said are valuable if any employee is to make a contribution to the company. Others responded similarly.

As an additional benefit, the graduates gain sources of information and professional contacts that help them do their jobs more effectively.

On-the-job learning, meanwhile, has been supplemented by a commitment to higher education. While McMahen has taken a variety of rigorous technical courses in quality assurance, Pearman, Robles and Schauer have been pursuing master's degrees and Walz a doctorate degree. Freda Reifer, Career Enhancement Program administrator, said she believed that in the long run the program will help employees reach their personal goals and provide the company with an expanded base from which to select its leadership. While in the program, individual employees are assigned mentors who are top managers in their departments. "Since all of the employees would like to become managers one day," Reifer said, "they take special care to observe management styles."

Any minority or woman salaried employee may qualify. Candidates are interviewed and their applications are reviewed by division management for acceptance into the program.

Three new participants started their job rotational assignments in January: Chia-Teh Bien, Facilities design and construction engineer; Karen Logue, Human Resources representative; and Julia White, Engineering supply material analyst.

Convair Investigator Helps Crack San Diego Check Forgery Ring By Julie C. Andrews

Convair security investigator Robert L. McAnelly received a disturbing call from the Finance department last September. A phony Convair payroll check had turned up at the company's bank clearing house.

Several days later, a San Diego merchant notified the company that his bank had returned a bad Convair check. More bad checks ensued, indicating an organized check forging ring.

Convair Security assigned McAnelly to the case. Although the company was not liable for the bad checks, there was concern that its reputation would be damaged.

Even though the local authorities had been notified, they did not yet have a case because none of the victims — mainly proprietors of "mom and pop" grocery stores — had sworn out a complaint.

McAnelly began by visiting the victims and persuading several of the merchants to go to the police.

"I told them that our company was not responsible and not liable, but the forgers made a mistake — they used our corporate name and that made us mad," McAnelly said. "Everyone was very cooperative."

McAnelly also began to collect evidence. Some merchants had photocopies of the phony checks and the bogus identification cards used by the check passers. From the actual photos of the passers on the ID cards, McAnelly was able to see the faces of his suspects, even though he had only fictitious names.

The first break came when one of the suspects panicked and fled after a store clerk became suspicious. The woman was arrested after being followed to an area hotel. Soon after, another passer was arrested, but the ringleaders were still at large.

The major break in the case came when McAnelly observed a change in the crooks' operation. Another phony Convair check showed up, but instead of being cashed at a store, this one had been used to open a checking account at a San Diego bank. McAnelly promptly notified the fraud and forgery detectives he had been working with. They staked out the address used to open the account.

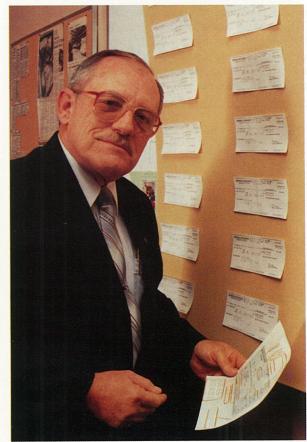
When the suspects were observed at the address, a search warrant was obtained for the following day. The raid took place early in the morning with several law enforcement agencies participating, along with McAnelly.

According to McAnelly, what they found was startling. "We found narcotics, money, fraudulent IDs and counterfeit checks in every room of the house," he said. "Convair checks were already filled out and bundled with phony ID documents ready to be sold to passers. The indications were that the criminals were about to undertake a very big score. The Convair checks alone totaled about \$750,000, and there were checks from other companies as well."

Since October, all the suspects arrested in the case have pleaded guilty to various counts of false personation, forgery, possession of stolen property and burglary.

"It was a fun case," said McAnelly, who earned the gratitude of company management as well.

"Bob persistently pursued leads and turned them over to the police investigators," said George W. Roos, Convair Division Vice President-Human Resources. "He was instrumental in bringing about a bust of a major crime in its early stages. He showed how industry cooperation with law enforcement can be used for public service."



Convair Investigator. Robert L. McAnelly shows some of the evidence he collected in cracking a check forgery case.

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DSD-Western Center Is Using Automation In Computer Control

Data Systems Division-Western Center has introduced automation to its computer operations center to better manage the way computers perform.

Western Center began a pilot project in April 1988 to evaluate an Automatic Cartridge Store (ACS) system in its computer center. The goals were to reduce costs in tape operations and save time in retrieving data stored on cartridges.

"The new system enables Western Center to significantly improve the service we provide to our division customers," said Lou J. Palmer, Director of Computer Services for Western Center. "The system improves the efficiency of the IBM complex and computer processing by virtually eliminating errors previously experienced with manual mounting of tapes."

The heart is a library storage module, a 12-sided structure that can store up to 6,000 tape cartridges. Inside the module, a freestanding robotic assembly retrieves, mounts and demounts cartridges. The robot finds the correct cartridge and validates that it is the correct one by reading its bar code label.



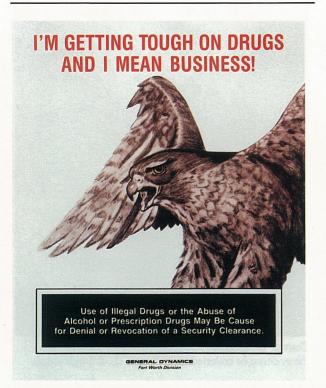
Computers Managed. R.C. Crews near one of the Automatic Cartridge Store system's modules housing approximately 6,000 tape cartridges.

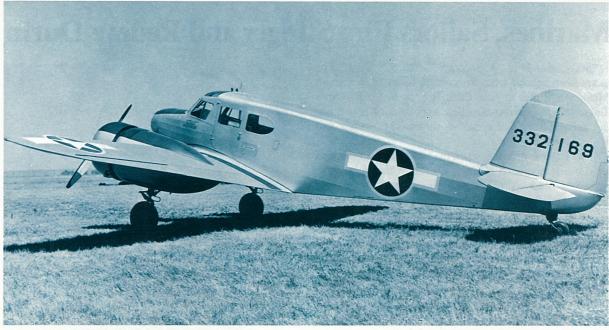
The robot extracts the cartridge from its cell, moves it to a transport and mounts it in a tape drive for reading. In effect, data is made available to an application robotically. This all happens quickly. Western Center's robot averages 12 to 15 seconds for the mount/demount cycle.

"We spent a fair amount of time examining what should go into the LSM," said R.C. Crews, Software Engineering Specialist and ACS team leader. "We decided we did not want to put 'dumps' and other 'write once' data into the ACS. We wanted those datasets that had a high read/write ratio."

The team developed a computer program that calculated the read/write ratio on all Western Center tape volumes and sorted the datasets into a list starting with the highest use. They began loading based on that list.

Western Center's computer center houses two library storage modules and a third is planned for later this year. Visitors to the center can "see" inside the module via a tiny television camera mounted on the robot that feeds images of its continuous motion to a TV screen in the control area. The robots operate around the clock, mounting about 8,000 tapes per week.





Bobcat Served in Various Roles During World War II and Helped Put Cessna on Sound Financial Footing

General Dynamics Flashback

Bobcat Was Right Plane at Right Time By Dave Lange

Cessna Aircraft Company today makes more small business jets than any other firm. Its 4,000 employees also build turboprop utility aircraft that have enjoyed much success with users such as Federal Express. The General Dynamics subsidiary has earned a reputation as a leading producer of small private and commercial aircraft.

Fifty years ago, this reputation almost didn't get a chance to develop. The Wichita, Kan.-based company struggled in the 1930s, as did many other businesses during the Depression. Cessna recorded a slight loss during the first quarter of 1939, and its employees numbered only about 200 in the summer of 1940.

But Dwane and Dwight Wallace, who had taken control of the company from founder Clyde Cessna in 1933, had ambitious plans. They sought to move Cessna into the small airline and charter market by developing a twin-engine aircraft that could carry five people. More importantly, this airplane could serve as a trainer for bomber pilots who would be needed in huge numbers as war spread around the globe.

"The plane that saved Cessna," as aviation historians have called it, was the Model T-50 Bobcat. Cessna was destined to produce 5,399 of the military trainer versions of the Bobcat with a work force that peaked during World War II at 6,074.

The aircraft was truly the right plane for the right moment. Design started in 1937 as fighting raged between the Chinese and Japanese and threatened in Europe. First flown in March 1939, the Bobcat had the kinks worked out of it by the time war began for England and its Commonwealth nations six months later. Although it would remain out of the fighting for two more years, the United States also had to train huge numbers of pilots in a hurry. With the T-50 already available, orders began to pour in from Canada and the United States in the second half of 1940.

Military evaluators who recommended the T-50 for purchase gave it high marks for its ruggedness on ill-prepared dirt airstrips and adaptability as a trainer, cargo carrier and personnel hauler. And it was easy to fly. As a publicity stunt, Cessna had a 17-year-old private pilot solo a T-50 after only 30 minutes of check time.

The Bobcat had a top speed of 185 mph, a wingspan of 41 feet, 11 inches and a fuselage of 32 feet, 9 inches. Pilots said it flew like a "small DC-3" and had good stability, gentle stall characteristics and pleasant response. Cessna originally sold the Bobcat at \$29,675 and reduced the price to \$28,000.

Output of the T-50 was a textbook study in wartime mass production. From June 1940 to the end of 1941, Cessna went through five major plant expansions, all completed with maximum effort in minimum time. After the sawdust had settled, Cessna had 360,000 square feet of floor space and had added 320 acres for runways. Around-the-clock shifts toiled on row upon row of Bobcats in various stages of completion. So efficient was the operation that Cessna's cafeteria service sent the food to the workers. In a first for the aircraft industry, electrically heated carts carried hot meals around the plants. Employees had only 25 minutes for lunch, but the carts served each department in five minutes.

These efforts resulted in an aircraft that served in all theaters of war where the Western Allies fought. The T-50's military incarnations were the Crane for the Canadians, the AT-8, AT-17 and UC-78 for the U.S. Army Air Forces and the JRC-1 for the U.S. Navy. Although named the Bobcat in an employee contest at Cessna, the T-50 was usually known as the Bamboo Bomber among the U.S. military.

One of the most impressive photos of the T-50 is a postwar shot of a huge expanse of surplus Bobcats at a storage depot. Although their military lives had ended, many of these planes continued in civilian use. The same features that made the Bobcat popular with Army Air Forces and Navy pilots endeared the plane to anyone who needed a reliable, cheap, easily flown transport. Some postwar Bobcats were even equipped with floats and operated off Canadian lakes.

Meanwhile, activity braked at Cessna in 1944-45 as abruptly as it had accelerated in 1940-41. T-50 production ended in 1944, and the surrender of Japan a year later ended Cessna's other wartime work. Employment quickly fell to 450. But the T-50 had served two purposes well: It trained the pilots whose big bombers obliterated the German and Japanese economies, and it put Cessna on firm footing for the future.

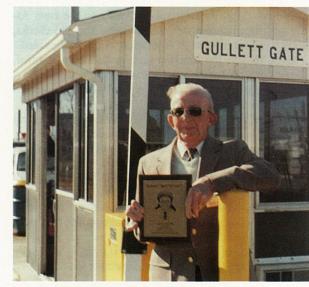
Land Systems Gate Named in Honor of Guard

A Land Systems employee literally got the gate after 46 years' service as a security guard at the Lima Army Tank Plant.

The vehicle gate at the Lima plant was named "Gullett Gate" in ceremonies commemorating the retirement of Robert H. (Red) Gullett, 70, who started at the plant in 1943

Gullett subsequently entered the U.S. Army and was wounded while serving in France. He returned to the tank plant in 1946 as a Department of Defense guard and went to work for the new plant contractor, Chrysler Defense, in 1978. Chrysler Defense eventually became Land Systems. Gullett holds the record for most years of work at the tank plant.

Lt. Col. John B. Scarfo, Plant Commander, presented Gullett with a flag that had flown over the plant and officially named the vehicle gate "Gullett Gate." G. (Dino) Salvador, Plant Manager, presented a plaque bearing Gullett's picture to be mounted permanently on the gatehouse. Frank J. Rupersburg, Land Systems Director of Industrial Security, retired Gullett's security badge number and presented him with a plaque with badges that represent his service with the different organizations at the tank plant during his career.



Getting the Gate. Robert H. (Red) Gullett, a Land Systems security guard, shows off the plaque to be mounted near the Lima Army Tank Plant's vehicle gate, named "Gullett Gate" in ceremonies honoring his 46 years at the plant.

Use of EM/OS Is an Indelible Part of Company's Daily Business By Joe Stout

New technologies have a way of being taken for granted once users come to depend on them. This has happened with the telephone, automobile and television, among hundreds of other inventions.

General Dynamics has witnessed a similar phenomenon in its assimilation of Electronic Mail/Office Systems (EM/OS). It has become an indelible part of the company's culture, making a lasting impact on the way the company does business.

EM/OS came to the company in 1982 when David S. Lewis, then the Chairman, chartered a group to develop an electronic mail system for the entire corporation. The group's efforts resulted in a customized version of Digital Equipment Corporation's All-IN-1 office and information system.

Today, EM/OS and 29 VAX computer systems supply service to more than 12,000 user accounts throughout the company, at customer facilities and at the offices of associate contractors.

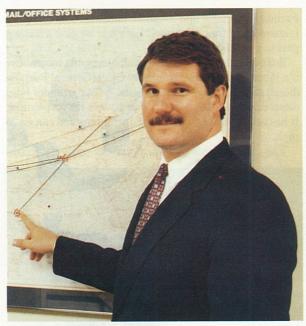
EM/OS is part of the information systems thrust that is improving the company's products, quality, performance, delivery and cost, according to Asaph (Ace) H. Hall, Corporate Vice President and General Manager—Data Systems Division.

"We're applying the technology creatively and innovatively so users have the information and resources they need, at the right time, to make decisions," he said. "The pressures are time, cost and quality. Cost is critical."

Today's system has gone far beyond the original objectives of EM/OS, said C. Steve Ziner, Director of Information Resource Management at Convair. In just six years, EM/OS has become interwoven with every aspect of General Dynamics' business.

Betty J. Garrison, Telecommunications Manager at Pomona, said, "EM/OS is as essential to the office as the telephone. Can you imagine building an office without a telephone?"

The benefits of EM/OS first became apparent at the Corporate Office, where communications must be maintained with company locations around the globe. "It would be extremely difficult for headquarters to operate in any-



Stateside Network. DSD Central Center's Richard V. Drummond, manager of the corporatewide EM/OS network, with map showing major EM/OS connections in the United States.

thing resembling real time, or to remain current, without electronic mail," said Donald E. Harris, Manager of Corporate Office Information Resource Management.

The communications capabilities of EM/OS are being used for many different functions at the divisions. These include travel requests, directories, weekly status reports and listing of plant bus schedules, to name just a few. The Daily News Summary, a shared file created by the Washington, D.C., Public Affairs Office, has become a standard source of information for the company.

The system also allows efficient communication among members of widely dispersed teams within the company. "The critical impact of tools like EM/OS is to reduce the time necessary to perform tasks and make decisions," Hall said. "Time is money."

EM/OS saves time through communication across time zones, elimination of "telephone tag" and by fostering better communication among employees at all levels, he said.

Kim Clare of the EM/OS support staff at Space Systems noted that the system encourages quicker, more open communication because "you no longer have to write formal memos."

Judy A. Alden, Chief of Management and Professional Computing Systems at Convair, added, "People thought electronic mail would eliminate personalities, but it doesn't."

EM/OS links Fort Worth with international offices and F-16 coproducer companies in 10 nations. When an issue arises in Turkey, for example, "they put the information on-line after we go home, so we get it first thing the next morning," said Willie C. Livingston, Director—Total Quality Management.

Plans for EM/OS include expansion of the network's capabilities. Target developments include integration with personal computers and putting more forms on-line. "Having forms on-line can greatly automate internal cycles," said DSD—Central Center's Richard V. Drummond, who is Corporatewide EM/OS Manager and was a member of the company's original EM/OS task team. "If you've got forms on-line, you get out of the paper cycle and into the electronic cycle."

A key element of the system's success has been the high priority placed on effective User Support services, according to Coralynn L. Nutter, Information Resource Management Chief at Space Systems.

EM/OS has become a useful tool in the company's initiatives to increase product quality and become more cost-competitive, Ziner said. "It gives us a command and control position that we did not have before."

Hall summed up the impact of EM/OS on General Dynamics: "We don't just think that it's nice to have any more. We need it."

Editor's Note: The information in this article was condensed from a Digital Equipment Corporation report on the General Dynamics EM/OS network.



Lowering the Colors. Fort Worth employees and Scout leaders Bernie A. Piorkowski of Industrial Engineering (left) and Douglas Robinson of Security fold the colors at the plant during National Scout Week.

Fort Worth Salutes Past, Present Scouts With Special Events

Fort Worth observed National Boy Scout Week in February with activities highlighting employees' present or past involvement in Scouting.

Plant security officer Douglas S. Robinson, a key organizer of the observance, described the events as a "week of memories, as people remembered their good times in Scouting."

Approximately 100 employees registered their Scouting experience in a log book placed in the main plant cafeteria at a Scouting display. About half were Eagle Scouts, Robinson said. Boy Scouts of America is trying to locate Eagles nationwide, encouraging them to become reinvolved in Scouting, he said.

Employees who are leaders or advisers to Scout organizations also donned their uniforms and lowered the U.S. flag outside the plant's main lobby.

Fort Worth employees support Scouting through their Con-Trib Club donations to the United Way.

Space Systems Reacts to Employee Concerns; Opens Child Care Resource Center By Julie C. Andrews

Maternity leave is over. It's time to go back to work. Before that day arrives, working parents must make a difficult decision: To whom will they entrust the care of their child?

Responding to concerns about child care raised by employees in the 1986 survey, Space Systems Division recently opened the Child Care Resource Center, which helps parents choose quality child care.

The center officially opened with a ribbon-cutting by Bernie A. Kulchin, Space Systems Division Vice President of Human Resources. Local day care representatives, union officials and employees attended the ceremony.

"Our people have said that child care is a critical need," Kulchin said. "The idea of this resource center is to provide a service to employees as an initial step in meeting this need."

The center is designed as a self-serve facility. Occupying a corner of one of the Space Systems administrative buildings, the center provides easy-to-follow directions on how to use the available materials.

Color-coded binders containing listings of county-licensed providers are keyed to large wall maps of San Diego County so that parents can look for care providers in specific areas. If a parent wants to check out several of the providers, more detailed information is available at the center and telephones are available.

"We sent out 1,200 child care provider surveys when we started the project," said Janet J. Goforth, Manager of Salaried Compensation, whose department set up the center. "We received 500 responses, which we used to set up the computer data base from which to output the listings."

The team responsible for the project included Alda O. Jorgenson, Jacqueline A. Newstadt, K. Susi Cowan, Nancy A. Rose and Violy M. Pingol.

Additional resources such as pamphlets, brochures and reprinted articles are available at the center.

Space Systems plans to continue providing resources to parents through a series of "brown bag" lunch meetings. Guest speakers will discuss a variety of topics of interest to parents, including the special needs of "latchkey" kids, choosing a pediatrician and choosing a preschool.



Child Care Resource Center Opens. Bernie A. Kulchin cuts the ribbon accompanied by K. Susi Cowan (center) and Jacqueline A. Newstadt.

Albinger and Moreno Are Honored by Institute

John Albinger, General Manager of Technical & Customer Service at Material Service Corporation, and Jaime Moreno, Manager of Technical Marketing, were elected Fellows of the American Concrete Institute (ACI) by its Board of Directors in recognition of their contributions to the institute.

The ACI defines a Fellow as "a person who has made

outstanding contributions to the production or use of concrete materials, products and structures in the area of education, research and development, design, construction or management."

They were presented with awards at ACI's recent annual convention in Atlanta.

Miniature Railroad Travels Around General Dynamics Missile Park By Julie C. Andrews

A loyal group of railroaders is keeping the romance of the train alive at General Dynamics Missile Park in San Diego. The quarter-scale miniature railroad known as the Kearny Mesa and Pacific Railroad opened on Easter Sunday as it has for 26 years since it made its first loop around the park's perimeter.

"The railroad was built in the early 1960s by a dedicated group of train buffs who had a vision of something unique for future generations of General Dynamics employees and their families," said Denby G. Jones Jr., Convair Facilities Specialist and longtime miniature railroad commissioner and train operator. "Last year we gave a lifetime pass to the 500,000th rider."

Built entirely in the plant by volunteers, the locomotive is a ¼ scale-model Electro-motive GP-9 (General Purpose diesel) still in use by most railroads. A four-cylinder Ford diesel engine with hydraulic drive powers the locomotive. It has full air brakes, weighs over three tons and can go 25 mph.

The cars are scale models of various open-top freight

REAR SECTION

Noted Train Engineer. Chairman and Chief Executive Officer Stanley C. Pace operates the Kearny Mesa and Pacific Railroad's locomotive with another engineer, Denby Jones, assisting.

cars, including one stock car dubbed the "pig palace," a favorite of children. The train can carry up to 100 passengers.

During the winter months when the train does not run, club members spend many a Saturday and Sunday in the train station's machine shop performing maintenance on the locomotive and cars. They also make sure the track is in tip-top condition.

"Safety is our prime concern," Jones said. "During operation, we are always on the lookout for hazards on the track. The majority of the train right-of-way is fenced, but we have four grade crossings and one tunnel," Jones said.

"Last year we pulled more than 35,000 people," he said. "That is about 500 people a day as we are open only on weekends from Easter to Thanksgiving — about 35 weeks. During that time, we had no accidents or mechanical breakdowns. In over 25 years, to the best of my knowledge, there has not been a single passenger or park patron injury. We are extremely proud of that record."

Safety becomes even more important during major events in the park such as company picnics when attendance may swell to thousands of people. To reinforce the railroad's safe operation, Jones has developed a training program. Employees who want to become train operators must log about 10 hours of "piggyback" training before soloing.

"Operating the train is simple," Jones said. "You don't have to steer. You only have to know how to pull the throttle back and where the brakes are. But you have to think like you would if you were operating a real train. For example, it takes about 1½ train lengths to stop. You have to constantly think ahead."

Jones chooses to wear traditional train engineer clothing, including a striped cap and bandana, when he operates the train. The bandana is decorative but functional as well. "From certain directions, the wind blows the diesel exhaust right back in your face," Jones said.

Club members say that the train can go on forever if properly maintained. Seeing the excitement of the children who visit the park and ride the railroad is proof that the fascination with trains is alive and well.

"One of the best things about being involved with the railroad is hearing, 'Daddy, can I ride the train?' "Jones said.

Pomona Employees Are a Big Part of Local Literacy Program By Susan Schaefer

At a time when President George Bush is urging Americans to adopt a "high moral principle of serving one another," many Pomona employees have done just that.

Fifty employees have volunteered their time and talents to teach others to read and write as part of an ongoing literacy program at the Pomona Public Library.

The program is a cooperative effort by the division, the local chapter of the National Management Association (NMA), the City of Pomona and the Pomona Public Library. The NMA is sponsoring the effort, providing volunteers and setting up the instruction programs.

Bernice Alexander, manager of the literacy program, said the decision to volunteer was easy. "It took me about two seconds to say yes when asked," she said.

Alexander, a voracious reader herself, is steadfast in her belief that "you're not going to learn better than when you're reading."

"Most people decide to learn to read because their jobs depend on it," Alexander said. "So I don't mind it a bit, giving my time to somebody who needs it."

Alexander is one of 29 volunteers who have completed a 12-hour training course in one-to-one methods of teaching reading and writing. After completing the training course, the volunteer tutor schedules a regular time and place to meet an assigned student for a recommended two hours per week, said Pomona Library literacy coordinator Muriel Spill, who helped conduct the training session. Then the tutor custom-designs a teaching method that takes into account the student's level of literacy, commitment to learning and speed in learning.

A variety of teaching methods is recommended by the library. One method is the Laubach Way to Reading series of workbooks, which stresses the use of phonics and a limited number of sight words. Another method, the Literacy Volunteers of America program, implements sight word recognition, consonant phonics, word pattern techniques and multiple syllable word techniques.

A popular technique for some tutors is to write down stories created by the students, who then learn their own words in the story through sight recognition, Still said. Playing word games, such as Scrabble, is another method, she added.

Learning to read and write, however, is not a game for most students. Students' reasons for learning range from a desire to finish their education or gain a job promotion to obtaining a driver's license, Spill said.

Most students lack self-esteem and are apprehensive about the program, which often requires extensive effort on their part, Spill said. The literacy program has had much success in terms of fulfilling students' needs, she added.

Nancy Elliott, a publications specialist, said she began tutoring because she liked the idea of helping others improve their lives. Recently, she said, she had been feeling less optimistic about her student's progress but was delighted by a learning breakthrough at their last meeting.

"Actually, helping others read and write as a volunteer tutor is selfish on my part," Elliott observed. "It makes me feel good."

In a speech before a training class of volunteer tutors, Pomona Mayor Donna Smith commended the employees' efforts. She urged the business community to follow General Dynamics' progressive lead and become involved in the fight against illiteracy. To support the employee effort, the division provided a \$1,000 grant to pay for books and other training materials needed for the program.

Government Waives Inspection of Abrams Tank Technical Manuals

The near-perfect performance by Land Systems in 1988 of turning out pages of technical manuals for the Abrams tank has led the government to waive inspection on future

The Land Systems Technical Manuals Department gave the government 15,000 pages for technical manuals, 99.8 percent error free. As a result, the Armament, Munitions and Chemical Command has waived the inspection normally required for acceptance.

Dewey E. Brown, Director-Logistics for Land Systems, credited the high quality performance to a five-point program started three years ago. He listed the points as: standards, goals, statistical control, verification of customer acceptance and recognition.

Standards were jointly developed by the Logistics Quality Assurance and functional departments responsible for delivering goods and services.

Goals were established, performance was measured and progress was reported regularly.

Statistics resulting from in-process reviews were used to pinpoint deficiencies for corrective action. "This visibility is a key element of building quality into our products instead of inspecting for deficiencies at delivery," Brown said.

Statistics were also maintained on the customer acceptance level of products at delivery, "the real measure of the effectiveness of the program," Brown said.

Quality performance and high productivity are recognized by the company in three ways. A director's trophy is awarded annually to the department achieving the highest overall quality levels and the department with the highest productivity improvement. Second, framed certificates are awarded to each department that meets its in-process quality goals. Finally, lapel pins are awarded individuals recognized for quality accomplishments.

"The program produced results in other areas of Logistics equally impressive to those achieved by technical manuals," Brown said. "The program is quite obviously a success, but it was the commitment to quality by each individual in Logistics that made it work."

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Casey and Jennings Win Company's 1989 Sloan Fellowships

John P. Casey, SSN 751 Ship Manager of Post-Launch at Electric Boat, and Richard W. Jennings, Chief-CAD/CAM at Data Systems-Western Center, have been named the General Dynamics winners in the 1989 Alfred P. Sloan Fellows Program.

Casey received the 12-month award at the Massachusetts Institute of Technology, while Jennings has been awarded the nine-month fellowship in the Stanford University Program. The program broadens and develops mid-management executives for more responsibilities.

"These rigorous and highly selective programs have proven their value to both employees and their sponsoring companies," said Herbert F. Rogers, President and Chief Operating Officer. "Our intention is to continue to send participants to each of the annual Sloan programs as part of our effort to prepare selected employees for key managerial positions."

The nominees were selected from a group of nine finalists submitted by executive sponsorship from the company's divisions. A committee of eight officers, chaired by Rogers, interviewed each of the finalists before making the final selections.

Guidelines for nominations were based on commitment, consistency of high performance, years of applicable experience and the potential of rising rapidly to an executive level in the company.

Casey, 34, a product of Electric Boat's Career Development Program, graduated from Worcester Polytechnic Institute in 1976 with a Bachelor of Science degree in Chemical Engineering and has a Master of Business Administration degree from Rensselaer Polytechnic Institute (Hartford Graduate Center).



y Jennings



Casey came to General Dynamics in 1979 from Clairol Inc. Since then, he has held positions as a supervisor, foreman and superintendent. He was appointed SSN 751 Ship Manager-Pre-Launch in 1985 and reached his current position a year later.

Jennings, 28, has been with the company for five years. He earned a Bachelor of Science degree in Mechanical Engineering from the University of Texas in 1982 and is in the Master of Science program in Electrical Engineering at San Diego State University.

A development engineer at Ingersoll Rand Turbo Machinery before coming to General Dynamics, Jennings has held increasingly responsible positions with Data Systems Division at Pomona and Western Center. He advanced from Software Engineer to Software Engineer-Senior to Supervisor-Engineering Systems before attaining his current position. He has been recognized as a top performer and has received three Extraordinary Achievement Awards

"We view the Sloan Program as a method of broadening our employees' management perspective and as a knowledge base for continued personal and professional growth," Rogers said. "We have found it to increase competence in quantitative analysis and functional business specialties and to improve skills in group and interpersonal relationships."

Other finalists for the program were: Henry J. Levine and Donna N. Collins from Fort Worth; Ross C. Houston of Electric Boat; Steven L. Allen and Michael R. Pouliot of Convair; Ann M. Sherman of Data Systems-Central Center; and David C. Nickerson of the Defense Initiatives Office in Washington.

Parts Control Successful

The F-16 was one of the first weapons systems programs to incorporate a parts control and standardization program. The concept has been used so successfully with the Fighting Falcon that it is now applied to almost all new development programs. Parts control ensures the development of producible, reliable and supportable systems.

San Diego High School Science Students Tour Wind Tunnel at Lindbergh Field By Julie C. Andrews

Science students from Samuel F.B. Morse High School in San Diego got their first look at a wind tunnel when they toured Convair's Lindbergh Field test facility recently.

The Low-Speed Wind Tunnel tour was sponsored by the Convair National Management Association (NMA) chapter and supported by the division as part of its Partnership in Education program with the San Diego City Schools.

Convair's Low-Speed Wind Tunnel is a low turbulence, subsonic wind tunnel in which a model can be tested at airspeeds of up to 270 mph. The facility is used by Convair and other General Dynamics divisions to test missiles and other air vehicles. The Aerotest Engineering group, which operates the wind tunnel, has also done work for outside customers.

The Convair NMA chapter and the division are involved in a variety of activities with its partnership school. In February, the NMA sponsored a speech contest and also invited a large group of students to attend an Engineering Career Day during the division's Engineering Week. Students met with Convair engineers to hear first-hand about their careers. Recently, the division donated funds to the University of California San Diego for a scholarship benefitting a Morse graduate.

Soon, Convair will begin a "Shadow" Program, when students will visit the plant for a half day, spending the time with a working engineer on the job. Another activity scheduled this month is the enhancement of an apprenticeship program at Morse supported by Convair and the U.S. Navy. The program will teach skills needed at

Convair, and the division will give consideration to hiring Morse graduates who have completed the program.



Wind Blown. Partnership students admire one of the six blades in the 20-foot-diameter propeller that drives Convair's Low-Speed Wind Tunnel. Test engineers Laura J. Healy (background) and A. E. "Ed" Brady (foreground) conducted the tour.

Cost/Schedule Control System Is Validated

Valley Systems Division will be more competitive thanks to recent armed forces validation of its Cost/Schedule Control System (C/SCS) for all present and future research and development contracts, according to Claude Bealer, Director-Budgets and Cost Analysis.

C/SCS provides cost and schedule information to help spot problems early and assist management to minimize the overall cost/schedule impact on a program.

More than 150 employees worked to obtain C/SCS validation over the last three years from the U.S. Army, Navy and Air Force, Bealer said.

C/SCS is a divisionwide system that is both a finance system for reporting contract costs to the customer and a management tool for program and line management.

The system is based on existing proven cost and schedule planning and control techniques. It is designed to provide the basic overall framework for effective manage-

ment of programs through the integration of management control systems for planning, scheduling, budgeting, work authorization and performance measurement, Bealer said.

The Rolling Airframe Missile full-scale engineering development contract was used as the demonstration model shown to a government review team.

The validation letter was presented to Vice President and Valley Systems General Manager Michael C. Keel by Robert D. Weidenmuller, Assistant Deputy Chief of Staff, U.S. Army Materiel Command. It was signed by Lt. Gen. Jerry Max Bunyard, Deputy Commanding General for Research, Development and Acquisition, U.S. Army Materiel Command.

General Bunyard wrote, "Successful application of C/SCS is a particularly noteworthy achievement. I congratulate you and your organization on the accomplishment of this very significant task."

Riding Up on the Elevator Is Not the Way to Go For Fort Worth Analyst Ronald W. Isbell By Joe Stout

Some people just don't understand Ronald W. Isbell's fascination with climbing stairs in skyscrapers. Comedian David Letterman even made fun of him on national television when Isbell climbed the steps of the Empire State Building.

He doesn't mind that, though, because he does it for a good cause.

Isbell, a financial analyst in the retirement section of Fort Worth's Payroll Group, has raced up the 1,535 Empire steps twice and the 835 leading up Reunion Tower in Dallas nine times. He has won all of the Reunion Tower contests and placed ninth both times in Empire stair-climbing.

"I enjoy the challenge," he said, "but the main idea is to raise money to help find a cure for cystic fibrosis." He has raised between \$100 and \$400 in pledges in each of the Reunion Tower races, which bring in about \$20,000 annually to fight the disease.

In addition to the other victories, Isbell has also won three races up the 32-story Continental Bank Building in Fort Worth. He is also an avid runner and has placed fourth and fifth in Fort Worth's Cowtown Marathon. He skipped last year's marathon when he traveled to Calgary to watch the Winter Olympics.

In 1984, Isbell and his parents attended a taping of "Late Night with David Letterman" in New York and spoke with the comedian before the show. Letterman included remarks about Isbell's stair-climbing venture in his monologue and invited him to return the following night to share the results.

Isbell and his parents went backstage the next night before the show and talked with Letterman, who again addressed Isbell during his monologue.



Marathon Finish. Fort Worth's Ronald W. Isbell (right) runs in the Honolulu Marathon in Hawaii. His best finishes have been in stair-climbing races.



Milestone Reached. Convair's management team attending delivery ceremonies for the 1,000th Tomahawk included (left to right) Charles E. Painter, Vice President and Convair General Manager John E. McSweeny, J. Frank Thompson, John DeBlanc, Bruce A. Ganoe, Ben J. Wier and James G. McIntyre.

U.S. Navy Accepts 1,000th Tomahawk SLCM At Naval Weapons Station, Seal Beach, Calif.

The 1,000th Tomahawk Sea-Launched Cruise Missile was delivered to the U.S. Navy on March 6th in a special ceremony at the Naval Weapons Station, Seal Beach, Calif. Rear Adm. William C. Bowes, Director—Cruise Missiles Project, accepted the missile on behalf of the Navy with a ceremonial signing of a DD250, the official delivery and receiving document.

Vice President and Convair General Manager John E. McSweeny represented the company at the ceremony.

"It has been a long road since 1972 when we first submitted our concept study for the cruise missile," McSweeny said. "We have experienced many technology breakthroughs along the way. I want to personally salute the superb leadership of the Navy and the people who had the foresight to back the Tomahawk program."

Admiral Bowes praised the Tomahawk weapons system as a strong deterrent, enabling the Navy to expand its strike platforms more than tenfold. "It has been a team tinue to be required into the future," Bowes said. "The entire Tomahawk team can stand tall when we look at the

Beach Naval Weapons Station, welcomed guests from Convair and McDonnell Douglas, the dual-source producers of Tomahawk, as well as subcontractor, civilian and military representatives. The Seal Beach Naval Weapons Station is one of several naval facilities responsible for loading, offloading and storing SLCMs once they are delivered to the Navy.

Cruise missile production began in 1980 and will continue into the mid-1990s. The total planned Tomahawk procurement is approximately 4,000 missiles. By the mid-1990s, approximately 100 submarines and 91 surface ships will be Tomahawk-capable.

effort to get Tomahawk to this juncture, which will conaccomplishments of the program." Capt. Stephen T. Holl, Commanding Officer of the Seal

Pomona Engineers Treated to Firsthand View Of Weapons on Cruiser Lake Champlain By Susan Schaefer

When 44 engineers from Pomona first looked at the USS Lake Champlain (CG-57) from the pier at San Diego Bay, the sight was one of imposing beauty.

The latest Aegis cruiser moored before them, wearing a clean coat of Navy gray, impressed the engineers. But they were more dazzled by the reputation of the ship, which the commanding officer, Capt. R. K. Martin, described as "the most sophisticated and powerful combatant ship in the Navy today."

When the Surface Navy Association recently invited the Pomona employees to tour the ship, several engineers who worked on the various elements of the ship's weapons systems were more than eager to go.

Design engineer Kirk Ferguson of Research and Engineering, who escorted the busload of engineers to San Diego, said the group was greeted warmly.

"The commanding officer and crew gave a highly informative tour of the ship's antisubmarine warfare and vertical launching systems, the Phalanx installations, combat information center and bridge," Ferguson said.

The ship is 567 feet long with a 55-foot beam and displaces 9,500 tons when fully loaded. At the heart of its

Aegis Cruiser USS Lake Champlain at San Diego Pier

combat systems is a state-of-the-art computer-operated command and control weapons system.

The integrated system is designed to collect, evaluate and display combat information, launch and guide missiles to their targets and share information with other ships and aircraft. Its modern radar system continuously detects and tracks hundreds of surface and air targets.

The vessel's weapons systems are capable of defending against any air, surface or subsurface threat. The systems include Standard Missile, Tomahawk and Harpoon missiles, Phalanx and 5-inch guns and torpedoes.

"Tours of vessels such as the USS Lake Champlain are very useful to engineers because they benefit from listening to the crew members discuss the performance and reliability of the weaponry we build as well as suggestions for improvements," said Ferguson, who is a retired Navy commander.

Group engineer Doug Briney of Test Equipment Development said the tour was his first opportunity in 17 years at Pomona to see the company's products on board ship and to hear sailors' impressions of them.

"After talking to the sailors, I came back with an even greater perspective of the importance of our products to those guys on the ships," Briney said. "Their lives depend upon them. More than ever, I realize the importance of my job."

Frank Robinson, section head of Test Equipment Development, said he was delighted with some of the comments he heard about the Phalanx close-in weapon system developed in Pomona.

"The weapons officer was in love with the Phalanx," Robinson said. "He could not say enough good words

Robinson said he looks forward to seeing General Dynamics' products on board again. "You can sit in your chair at work and think your design is the best in the world," he said, "but when you see the product in place and get feedback from the people using it, it really makes a difference. When they like my design, it's great, but when improvements are needed, it's my challenge to keep improving it."

'Missing' Tools Case **Solved by Fort Worth Employee 'Resolvers'**

The "Resolvers," an Employee Involvement Team in Fort Worth's Production Department, has found a way to end the scarcity of certain special tools needed by the division's Tool Manufacturing Machine Shop employees.

Team members felt that many more tools would be available if their fellow employees could be convinced to stop "hiding" the tools for future accessibility.

The first step was to conduct a systematic "purge" of the department's work areas to turn up hidden and otherwise unaccounted-for tools, said Charles O. Norvold, the Employee Involvement Team leader and supervisor of the department.

Norvold said that Rich E. Briggs, Fort Worth's Director of Tooling and Manufacturing Engineering, had so much confidence in the process that he granted the team approval authority for all departmental orders to purchase new tools or accessories and approval authority for any item to be identified as surplus by the department.

The team was allocated a budget of \$40,000 to obtain additional assets and replace tools that had become worn or broken. In addition, the Resolvers accepted responsibility for tracking the special tools and maintaining them in work-area storage cabinets as an alternative to having employees set them aside for future use.

Employee Involvement Team members were not surprised when "lost" and "missing" tools suddenly reappeared after employees became convinced that steps were being taken to increase tool availability, including the ordering of replacements, said Charlene M. Heidy, facilitator for the team.

The process will probably result in a cost savings, according to Briggs. "The money for additional tools is there for them to use as needed," he said. "But so far, they're finding so much equipment in the shop that they aren't having to buy as many items as they expected."

Norvold said the project has been successful because of the cooperation of employees on all three shifts. "The team has turned up more than 1,300 items of equipment that were previously unaccounted for," he said.

Briggs said the project also has potential to improve product quality by helping to ensure use of the proper tools for given tasks. "The project has been a first step in establishing a meaningful communication between work shifts," he added.

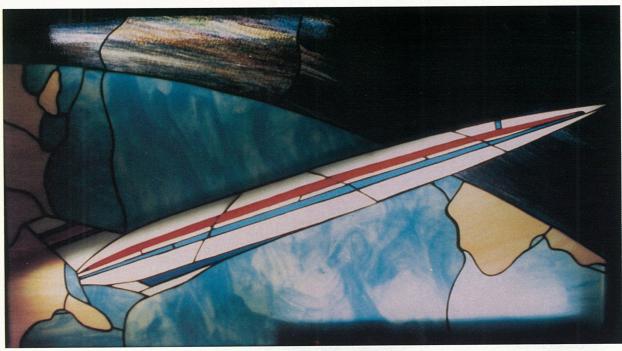


'Missing' Tools Back in Circulation. Machinists Michael J. Nivens, Albert W. Smyrychynski and T.J. Williams (left to right) document unaccounted-for cutting tools that reappeared through the efforts of the Employee Involvement Team The tools are used with num control milling machines.

Savings and Stock Investment Plans Annual Rate of Return for the

12 Month Period Ending:

	12 Month I chou Ending.		
Salaried	Feb. 1987	Feb. 1988	Feb. 1989
Government Bonds	9.2%	6.9%	6.2%
Diversified Portfolio	31.9%	(4.3)%	13.2%
Fixed Income	12.0%	11.2%	10.6%
Hourly			
Government Bonds	9.4%	7.1%	6.3%
Diversified Portfolio	33.4%	(4.4)%	13.3%
Fixed Income	11.9%	11.2%	10.5%
GD Stock Closing Price	\$78.75	\$52.50	\$50.75
() Denotes Negative N	umber		



Window to Future Flight. A stained glass mosaic by Charles W. Anderson, assistant deputy for projects at the National Aero-Space Plane (NASP) Joint Program Office, Wright-Patterson AFB, Ohio, depicts the X-30 test vehicle in orbit around the Earth. General Dynamics is one of three airframe companies working on competitive preliminary design of the X-30 aircraft. Fort Worth is leading the effort.

Land Systems Names Quarter's Top Supplier

Land Systems has named Cherokee Nation Industries as recipient of the division's first "Supplier of the Quarter" award. The award recognizes vendors who continually provide distinguished performance in the supply of parts and services.

Thomas Bledsoe, Land Systems Director of Procurement, presented the award to Phillip Wiltfong, Cherokee Nation Industries Vice President of Marketing, in ceremonies at the division headquarters in Sterling Heights,

Cherokee Nation Industries, a small disadvantaged

business owned and operated by a Cherokee Indian Tribe, builds electrical wiring harness assemblies for the Abrams tank in its Stilwell, Okla. plant.

The Indian company is the first Land Systems supplier to receive full Statistical Process Control approval, which allows the Cherokee company to ship completed hardware without the usual Land Systems inspection process.

Participation in this program by Cherokee Nation Industries insures quality parts with reduced inspections, at lower cost to the U.S. Army and the American taxpayer.

Quonset Point's Jean Coy Receives Top Award From Rhode Island Girl Scouts By Richard A. Boudreau

Jean Coy, Supervisor of Computer Operations Services at Electric Boat's facility in Quonset Point, was one of four Rhode Island women presented with the prestigious Juliette Award by the state's Girl Scout Council.

The presentation was made recently at a Women in Leadership Honors Evening in Newport, R.I.

Coy's achievements included being named to the "Sterling 100" by her alma mater, Sterling College, on its centennial; being selected for inclusion in the 16th edition of Who's Who Among American Women; and being named last year by Electric Boat as one of Quonset Point's "Professionals of the Month."

Coy has also served as organist and choir director in various churches for 20 years. She is the former music consultant for Southern Baptists in New England and she is music director for the Pawtuxet Valley Community Chorus in Rhode Island.

The chorus makes appearances at local nursing homes and churches and occasionally at special community events. "We have a good time. We cheer people up with our music," Coy said.

In addition, the chorus works on a variety of fundraising activities to provide an annual college scholarship to an area high school graduate who plans to major in

Coy also has displayed leadership, part of the criteria for the Juliette Award recipients. "As a former Girl Scout, I feel that young girls and young women today need to be able to stand up and speak out for their beliefs," Coy said. "They need an organization that teaches that it is OK to help others and to maintain a strong belief in God and

After receiving her degree from Sterling College, Coy taught music in Sterling, Kan. She moved to Connecticut

and, unable to secure a teaching position, went to work at Electric Boat at Groton as a key-punch operator. Within a year, she was promoted to a supervisory position. While at Electric Boat, she earned a Master of Arts degree in Industrial Organization Psychology and a Master of Science degree in Industrial Relations from the University of New Haven. In her third year at Electric Boat, Coy transferred to Quonset Point.

According to the booklet published for the Juliette Award ceremony, Coy has "demonstrated time and time again how personal determination and perseverance can create the catalyst that brings out the achiever in all of us."



Coy Honored. Jean Coy is congratulated for receiving the Juliette Award by Bernard J. Breen, Data Systems Division Vice President and Eastern Center Director (left), and William W. Bennett, Electric Boat Division Vice President and Quonset Point General Manager.

Vollmer Joins Board of Superconductivity Group

Charles D. Vollmer, Staff Vice President-Defense Initiatives Office, has been named to the Board of Directors of the Council on Superconductivity for American Competitiveness (CSAC).

The CSAC is a non-profit association of 55 businesses, laboratories and universities that studies commercial

applications for traditional and high temperature superconductors.

Vollmer has been with the Defense Initiatives Office since its inception in 1987. The group pursues ongoing and future programs in government Strategic Defense, Air Defense and Conventional Defense initiatives.

A-TEAM Assaults Fort Worth Issues In Cost Reduction

In the television program, the "A-Team" is a renegade group of former military personnel with a can-do attitude and a knack for "making a plan come together," as their leader often says.

At Fort Worth, the A-TEAM is a group of Product Support Engineering employees. They use problem-solving techniques of employee involvement and value engineering to enhance the division's major product — the F-16 Fighting Falcon — and reduce costs.

Employee involvement, an outgrowth of the traditional quality circle concept, has been used to improve administrative and technical efficiency at many company facilities. Fort Worth's A-TEAM uses group problem analysis and innovation while seeking ways to increase customer satisfaction with the F-16.

"The Product Support Engineering section is extremely close to customer concerns because we deal directly with the customer on a daily basis," said Leon P. Dodd, the group facilitator, or leader. "The Aircraft Technical Enhancement After Manufacture group, or A-TEAM, is a natural product support working group that meets specifically to identify customer needs and concerns."



A-TEAM at Work. A-TEAM members Robert J. Weiser (left) and Leon P. Dodd study an aircraft battery heater blanket, one of the F-16 components the team has identified for possible enhancement.

Members of the team learned problem-solving techniques through team leader training, an in-house Human Resources course supporting the employee involvement program, and through value engineering seminars. Approximately 3,500 Fort Worth employees have been trained in value engineering methods in 96 certified value engineering seminars.

The team meets weekly to brainstorm product support issues and document potential solutions identified for further study. "A team project concerning the F-16's Environmental Control System probe is a good example of how the process works," Dodd said.

The glass sensor probe often breaks during removal, replacement and shipment, he explained. The team conducted a survey using value engineering methods and recommended the installation of a guard device to protect the flow sensor probe.

The change is being considered for Block 50 USAF F-16s and other aircraft on an attrition basis, with a significant potential for Air Force cost savings, Dodd said.

F-16C/D Radar Reliability **Saves Money for Air Force**

The APG-68 radar system installed on Fort Worth-built F-16C/D aircraft can operate for longer than 100 hours without any maintenance actions, according to a recent U.S. Air Force announcement.

Radar reliability is a key factor in the F-16C/D fleet's overall mission capability rate, which routinely measures over 90 percent. The Air Force's F-16 System Program Office projects that the Air Force will save over \$60 million in radar spares and repairs due to the APG-68's outstanding reliability.

New Series of F-16XL Flight Tests Could Lead to Commercial SST By Joe Stout

General Dynamics' F-16XL technology demonstrator aircraft will be used in a new series of tests that could lead to development of a 21st century supersonic transport.

The National Aeronautics and Space Administration (NASA) will test fly the single-place F-16XL No. 1 prototype and the two-place F-16XL No. 2 for three to four years evaluating technologies to improve the efficiency of supersonic flight. Test results could be applied to an American follow-on to the Concorde SST, said Russ Barber, NASA's F-16XL Project Manager at the Dryden Flight Research Center at Edwards AFB, Calif.

The aircraft are on loan to NASA from Air Force Systems Command.

Barber said the F-16XL was selected partly because its distinctive cranked-arrow wing design, jointly designed by NASA and General Dynamics, originally grew out of a previous program to study SST concepts.

The aircraft is being equipped with an experimental wing glove perforated with thousands of tiny, laser-cut holes connected to an air pump in the fuselage. The unique design is expected to promote smooth, uninterrupted air flow over the wings in supersonic flight, decreasing drag, turbulence and subsequent fuel consumption. The glove covers about 10 percent of the wing's leading edge.

Company test pilot Joe Bill Dryden, one of the original F-16XL project pilots, returned F-16XL No. 1 to the air in a 1.5-hour functional check flight on March 9th. The aircraft last flew on Aug. 14, 1985, when it was returned to Fort Worth from Edwards AFB.

The second "first flight" marked the 438th sortie and 535th flying hour the aircraft has logged since it was extensively modified to the F-16XL configuration in the early 1980s. F-16XL No. 1 flew for the first time in July 1982.

Dryden flew the aircraft to Edwards for modifications on March 10th. Barber said NASA engineers first subjected the airframe to a vibration test, to obtain its baseline structural response characteristics, and then began preparing it for installation of the laminar flow glove.

The aircraft will also receive new instrumentation to collect data on about 150 additional evaluation parameters, Barber said. The experimental airplane already carries extensive instrumentation.

The two-place aircraft, F-16XL No. 2, will fly again



F-16XL Shown with Standard F-16 to Accentuate Its Wing Design

soon. It flew for the first time on Oct. 29, 1982, and has logged 406 flying hours in 361 flights.

NASA will initially use the No. 2 aircraft for pilot checkout flying. Based on results of the F-l6XL No. 1 tests, plans call for the two-place aircraft to be fitted with a wing glove and "modified wing geometry," according to Barber.

Later, the wings of both aircraft will probably be modified in other ways to increase laminar airflow (airflow across the wings) and reduce drag, Barber said.

Fort Worth began preparing the F-16XLs for flight after the loan agreement was finalized in January. The process included bringing the aircraft up to date with inspections, system checkouts and change orders that have been outstanding since their last flights.

Dryden said he prepared to fly the F-16XLs again through cockpit refamiliarization and review of technical manuals. He said the airplanes "like to go fast" and handle extremely well.

The most visible difference between the F-16XL and the standard F-16 is its larger, cranked-arrow wing. The F-16XL was one of the first fighter aircraft to successfully incorporate all-composite wing skins. The aircraft also has a 56-inch longer fuselage to accommodate the larger wing and more internal fuel.

F-16XL No. 1 is powered by a Pratt & Whitney F100 engine, while aircraft No. 2 is equipped with a General Electric F110.

Both aircraft performed successfully in hundreds of flight tests. Although the modifications provided substantial advantages in air-to-air and air-to-surface capabilities, the F-16XL was not developed further because of budget limitations.

Modifications are being performed by NASA. General Dynamics is assisting with aircraft technical support during the test program.

These EB Employees, Like Submarines, Operate Under Water By Rosemary L. McBride

If a submarine should develop a problem, it's not unusual for Electric Boat to fly a diver to the submarine to help with repairs. The division's diving group has to be ready for any assignment, whether at the shipyard in Groton, Conn., or somewhere across the globe.

The divers, who come under the umbrella of the diverse Carpenters Department, spend much of their time carrying out many underwater tasks involved in the construction of submarines, such as painting, grinding, testing equipment, installing sonar and hoses and inspecting.

Sometimes their equipment includes videocameras used to photograph submerged portions of a boat and two-way radios to communicate with Electric Boat engineers while troubleshooting problems. After 22 years of diving at the division, Arthur H. Davis has witnessed dramatic changes in technology. "When I first started at Electric Boat, we used the surface-supplied air system and our gear included hard hat and breastplate, like what you see divers wear in the old movies," Davis said. "As a matter of fact, the astronauts used this awkward equipment while training to walk on the moon."

Thomas A. Rizzo, who has about 2 ½ years of experience, agrees with Davis that modern technology has improved diver performance. "You never know what's going to happen or what you'll be called on to do next," Rizzo said.

At the division's facility in Quonset Point, R.I., divers ensure that the pedestals of the Sea Shuttle, which is used to transport submarine hull cylinders by water, are properly balanced before the components are loaded for the trip to Groton. They periodically inspect *Winslow Kelsey*, Electric Boat's tugboat. And, in conjunction with the industrial hygienists at the division, the divers take shellfish samples from the Thames River to provide data to the government's environmental agencies.

These functions must be accomplished in as much as 40 feet of water, using a flashlight. The divers work year-round on day and night shifts. The glamour of the job soon fades considering the cumbersome equipment each diver must carry around the body, including 35 pounds of lead. And then there's the New England weather. Davis said that during the winter months the divers have had to drill through 17 inches of ice before being able to work. The dangers of the job, such as decompression, more commonly known as the "bends," are also present.

But, according to Davis, there are lighter moments, too. "I was in the water working on one of the boats when I felt something nudge me in the back," he said. "I turned around and saw several baby seals swimming nearby. The babies were very friendly and let me scratch their bellies. But a few minutes later, after I'd surfaced for a moment, I heard another seal barking loudly in the distance. Immediately, the young seals took off and joined their mother. I could see that she'd been sunning herself on a rock and suddenly realized that her babies had strayed too far away."

Each diver, however, takes his job seriously. Preparing for a dive is not simply a matter of suiting up and jumping in. The divers must complete a lengthy safety checklist before entering the water.

The employees who tend to the divers also play a key role in the operation. In addition to lugging equipment, the tenders service, maintain and inspect all gear. They watch the divers' bubbles when the divers are in the water and maintain radio communication with the shipyard. The safety record of the group speaks for itself — there have been no accidents.

"The layman has very little idea of what diving at Electric Boat encompasses," Rizzo said, noting that he was surprised by the complexity of the operation when he joined the group. "We're proud of the unique part we play in building submarines," Davis said.

(Rosemary L. McBride is Electric Boat's Division Ombudsman.)



Electric Boat's Diving Team. Seated (left to right) are diving tenders Ambrose M. Deveau, James J. Christina and Roland M. Allard. Standing (left to right) are divers Joseph N. Talbat, Sabino "Bing" Nardone, James Munroe, Arthur H. Davis, Thomas A. Rizzo and Wayne R. Flynn, Diving Supervisor.

GENERAL DYNAMICS Wolume 19 Number 5 May 1989



John Aubert, Pomona Division's environmental resources manager, inspects the ozone tanks at the facility's new Traeger air pollution control system. Combined with a new self-contained robotic paint shop, the system reduces hydrocarbon pollutants by more than 95 percent.

Pomona's pollution controls earn state and regional recognition

ALIFORNIANS ARE PUTTING Pomona Division's environmental management programs on notice—the kind of notice the division loves to have.

Pomona's successful environmental efforts recently earned two awards. The California Water Pollution Control Association named the division the Plant of the Year. Meanwhile, the South Coast Air Quality Management District selected Pomona for the Clear Air Award.

Pomona was nominated as Plant of the Year by the Los Angeles County Sanitation District for the division's comprehensive program that has eliminated discharge of almost 10,500 tons of liquid and solid hazardous waste per year. The water pollution control association presented the award during its annual meeting in Palm Springs, Calif.

In separate ceremonies, the division received the Clean Air Award from the greater Los Angeles regional authority responsible for improving the air environment throughout most of Southern California. Pomona's recent installation of a \$1.4 million robotic paint facility and the Navy's purchase of a state-of-the-art ultraviolet oxidation air scrubber have reduced organic air emissions by more than 95 percent from 12 tons to .5 tons

per year. The award was accepted in Los Angeles by Pomona General Manager Sterling Starr and Capt. Earl Major, commander of the Naval plant facility.

The facility's recognized success follows a commitment by the U.S. Navy and General Dynamics to provide a safe and healthy work environment and achieve zero discharge of hazardous waste from the facility, according to John Aubert, Pomona's environmental resources manager.

"We recognize that if we do not take these positive actions now, our ability to do business will be seriously impacted because of legitimate growing public concern over the region's deteriorating environmental quality," Aubert said.

In cleaning up its wastewater discharges, Pomona Division combines product substitutions, changes in its manufacturing processes and state-of-the-art metal plating recovery systems.

The air pollution control equipment applies ozone through a water-packed scrubber and filters the air through a carbon absorber to remove hydrocarbons from the paint shop's exhaust. Hydrocarbon is considered a primary pollutant and is active in smog forma
(Continued on Page 2)

Top safety award goes to Land Systems

Land Systems recently received the Chairman's Award of Honor for excellence in safety and health performance for 1988.

Chairman and Chief Executive Officer Stanley C. Pace presented the award, the top honor in the company's Corporate Safety and Health Performance Recognition Program, to Land Systems Vice President and General Manager Robert W. Truxell during the Quarterly Review meetings at the Corporate Office.

"Land Systems has made tremendous strides in improving its safety and health program since it was acquired by General Dynamics in 1982," Pace said. "Without question, Land Systems has the best division-wide safety and health program in the company today.

Bob Truxell's insistence on a high-quality divisionwide program and the dedication to safety and health by all the employees of the division have resulted in this recognition."

Electronics Division was selected for the second-highest honor, the Chairman's Award of Merit. In addition, those divisions, subsidiaries or operations that excelled in safety and health received a Certificate of Achievement Award. Certificates of Achievement went to Convair, Valley Systems, Fort Worth, Camden and Underground Operations of Freeman United Coal Mining Co.

The program began in 1986 to honor those divisions and subsidiaries that have excelled in safety and health.

News Briefs

Company earnings fall following slump in Military Aircraft

General Dynamics' earnings for the first quarter of 1989 fell \$10.3 million over the same period a year ago, due mostly to expenses for the Advanced Tactical Fighter and a decline in F-16 earnings.

First-quarter earnings were \$75.4 million, or \$1.81 per share, on sales of \$2.4 billion. During the first quarter the company adopted Statement of Financial Accounting Standards No. 96, Accounting for Income Taxes. Net earnings for the first quarter of last year, restated to reflect the new standards, were \$85.7 million, or \$2.04 per share, on sales of \$2.4 billion.

"First-quarter results were affected by a decline of operating earnings in the Military Aircraft segment," Chairman and Chief Executive Officer Stanley C. Pace said. "This decline results from lower volume and a reduction of the earnings rate in the F-16 program reflecting lower margins on recent contract awards as well as cost increases resulting from simultaneous production of more than 20 versions of the aircraft. In addition, continued cost-sharing expenses for the Advanced Tactical Fighter contributed to the decrease in operating earnings of the Military Aircraft business."

However, improved manufacturing techniques and cost containments continued to raise Land Systems' performance and the increasing demand for business jets maintained Cessna's forward momentum, Pace added.

Japan, U.S. reach FS-X accord

Japan and the United States have agreed to codevelop and co-produce the FS-X fighter, a derivative of the F-16 Fighting Falcon, for Japan. Forty percent of the FS-X work will be done by U.S. companies including General Dynamics.

As *General Dynamics World* went to press, the Senate cleared the way for the Bush administration to proceed with the FS-X plan.

Japan will require up to 130 FS-X fighters. Production is scheduled for the mid-1990s.

GD computer work praised

Robert Costello, the undersecretary of defense for acquisition, recently congratulated General Dynamics for participating in a cooperative that assists the government in one of its most important computer-aided acquisition and logistics system programs.

PDES, Inc., helps the government with a program known as product definition exchange specification. The program will allow the electronic transfer of product design information between dissimilar computer systems in contractor and government facilities. Beginning in 1990, all new military programs must comply with program definition exchange specifications.

"Your corporation's response and leadership in being one of the charter members of the PDES Cooperative . . . is to be commended," Costello wrote in a letter to General Dynamics. Data Systems Vice President and General Manager Asaph H. Hall served as a member of the cooperative's interim board of directors. George Kaler, director of information resources at Fort Worth, is a member of the board. Corporate Attorney Ardelle St. George is corporate secretary and general counsel for the cooperative.

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News Briefs



General Dynamics Chairman and Chief Executive Officer Stanley C. Pace (left) and INTELSAT Director General Dean Burch sign the contract for INTELSAT launches on Atlas IIAS vehicles. A model of the Atlas IIAS stands in the background.

INTELSAT signs up for two 1993 launches on Atlas IIAS vehicles

INTELSAT and General Dynamics marked 20 years of partnership with a ceremony appropriate to the occasion in Washington on April 21.

Officials of the companies signed contracts for two launches of INTELSAT communications spacecraft aboard Space Systems' Atlas IIAS vehicles. The signing came on the 20th anniversary of General Dynamics' first order from the owner and operator of a global satellite communications system used by 116 nations.

The latest contract calls for both launches in 1993 from Cape Canaveral Air Force Station's Launch Complex 36B. The agreement also includes options for additional launches.

Atlas has launched 24 INTELSAT spacecraft over the last 15 years. The Atlas IIAS is the newest member of the Atlas family.

Cherokee supplier honored

Land Systems has named Cherokee Nation Industries the first winner of its Supplier of the Quarter award. The Stilwell, Okla., company builds electrical wiring harness assemblies for the M1A1 tank.

Cherokee Nation is a small disadvantaged business that employs mostly Cherokee Indians. It is the first Land Systems supplier to receive full statistical process control approval. That allows the company to ship completed hardware without the usual Land Systems inspection. Participation ensures quality parts with reduced inspections at lower costs.

Cessna offering free service

Cessna Aircraft Co. is offering a deal every carbuyer would love: no-cost maintenance during the first four years or 2,400 flight hours for Citation III business jets purchased before the end of the year.

Called the Total Confidence Contract, the guarantee covers all service parts and maintenance except engine and auxiliary power unit repairs.



Pace discusses succession

On June 1, Stanley C. Pace will complete four full years with General Dynamics, all but the first six months of which have been as chairman and chief executive officer. Both Mr. Pace and Herbert F. Rogers, president and chief operating officer, have announced plans to retire at the end of 1990.

Who will succeed to these two top executive office positions? During an April 26 interview with Barron's (National Business and Financial Weekly) and in several recent meetings with division and corporate employees, Mr. Pace discussed the subject. Excerpts of his comments follow.

"Management succession is, of course, one of the major goals that I set when I arrived in 1985 — and one of the more important jobs that I've had here.

"During my first few years I focused on other objectives, but in the last year or so I have been giving more attention to the succession subject.

"Since General Dynamics was formed in 1952, there have been five CEOs, none from inside the company. That's a pattern I've said I would like to break, if possible. I'd like to compliment our own company management by selecting someone from inside.

"However, I did commit to the board of directors that I would not restrict my search, that I would also look in the marketplace and compare what was available there with what was available inside.

"That is what Herb Rogers and I are doing now. Since Herb will also retire next year, we are both in a position to evaluate people without any biases. We believe we have progressed to the point where we

have identified what is available within the company. So for the past few months, we have also been looking outside.

"We are hopeful that we can make a decision and have someone in place — as vice chairman or with some other title — by the end of this year or sooner, if possible. That person will be identified at that point as my successor and will become chairman and chief executive officer on Jan. 1, 1991.

"Herb's replacement will not be named until the new CEO has had an opportunity to assist in that selection. There are several possible scenarios, depending upon how much time might be wanted or needed to identify a president with whom everyone would be comfortable.

"Our list of outside candidates for the CEO position has included some within the defense industry and some outside. But obviously those in this business — which is significantly different from the commercial world — would have a leg up. I've participated in both defense and commercial and it's clear that the differences are considerable and should be recognized.

"The search process has not proceeded to the point where we are talking to the board about specific recommendations. However, the directors have a definite awareness of the criticality of identifying a successor according to the schedule we have established.

"Do I know who my successor will be? Do I know if it will be someone from inside or outside? The answer to both questions is 'no.' When will you know? Just as soon as the board decides."

Focus groups forward data for questionnaire

(This is one in a series of columns by Naomi M. Morales, Survey of Employees manager, that will appear in General Dynamics World in the months before and after the survey this fall.)

The series of focus groups being conducted by division survey managers has almost been completed. The information from these 35 focus groups will be used to create the survey questionnaire.

Over 300 employees from all occupational groups across the corporation are included in the focus groups that met with a task force of division survey managers. The task force has met with top division management, middle managers and first-line supervisors



Focus groups have included salaried non-management employees such as engineers, programmers and

administrative specialists. The participation of salaried support and hourly employees has been of special interest. For this reason, some focus groups consisted of technicians, skilled craftsmen, production personnel and secretarial support personnel.

As in the 1986 survey, the company will integrate the focus groups' findings with input from the division management teams at each location to develop the survey questionnaire. For this survey cycle the task force of division survey managers is handling the majority of the survey process with some assistance from the consulting firm of Sirota, Alper and Pfau.

The survey will include about 100 questions. Approximately 75 questions will be asked of all employees. The remaining questions will deal with issues unique to each division.

Since the questionnaire will be much shorter than in 1986, the questions will be carefully focused. This will provide locations with the information they need to improve operational effectiveness of their organizations.

Pomona

(Continued from Page 1)

tion. Pomona's equipment is the first to use ozone with water as the primary destroying element in air pollution control equipment.

An important feature of the new equipment is the low operating cost and the elimination of liquid hazardous waste as a byproduct of cleaning the air.

"The corporation and the government together have spent more than \$8 million installing the latest advanced technology systems at the plant to clean up our wastes and recover material for recycling," Aubert said. "Much of the equipment had to be specially designed since we could not alter the government specifications on our products."

Pomona began its extensive cleanup in 1986. Since then, the division has become a recognized leader in its environmental management programs. Pomona has been cited as a positive example of industry cooperation by the federal Environmental Protection Agency, the U.S. Navy and the California State Department of Health as well as regional and local environmental agencies.



F-16B No. 82, tail No. 813, maneuvers to display a white High Speed Anti-Radar Missile during a test sortie flown over the Mojave desert near Edwards Air Force Base, Calif.

Old gold: No. 82 hits 2,000 sorties and still going strong

EMBERS OF THE F-16 Combined Test Force at Edwards Air Force Base, Calif., recognize there is something special about one of their airplanes, F-16B No. 82, tail number 813.

The two-place aircraft recently logged its 2,000th test sortie and 2,477th flight test hour, surpassing the records of all other F-16s in the Edwards inventory.

It is certainly not the oldest Fighting Falcon there. Several of the Edwards airplanes have been in service since early in the F-16 program. One test aircraft, F-16B No. 1, is a full-scale development airplane that predates the beginning of production deliveries in 1978.

"While all F-16s are solid aircraft, we could tell early

on that No. 813 was put together very well," said Fort Worth Flight Test Engineer Lloyd E. Ort, who works with the Air Force's 6516th Test Squadron.

"Over the years, the aircraft has never suffered the little nagging maintenance problems other planes sometimes do. Whenever we schedule the airplane, everyone is pretty confident the sortie will go," he said, adding that the aircraft's General Dynamics maintenance crew also deserves part of the credit.

Edwards, 100 miles north of Los Angeles, is the home of the Air Force Flight Test Center. Its F-16 Combined Test Force is composed of General Dynamics and Air Force personnel.

No. 813's first flight at Edwards, in May 1983, was related to its fire control radar system and weapons integration. Its 2,000th flight was a test with a High Speed Anti-Radar Missile.

Ort said the aircraft is used in F-16 Block 40 radar tests and is also scheduled for tests with the Block 50 radar version. He predicted that it will eventually reach its 5,000th test sortie in the late 1990s.

"People in the flying business are going to look back on No. 813 one day as the standard that every airplane should try to achieve," he said. "This plane has done a great deal for America in testing the weapon systems the F-16 will use to defend our nation."



Fort Worth's Dave Cave performs at a meeting during the Savings Bond drive while joking with Dorothy J. Davis of the division's small/disadvantaged business office.

GENERAL DYNAMICS

Published by: General Dynamics Corporation Pierre Laclede Center, St. Louis, Mo. 63105

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Dave Cave is rave of bond campaign

Many employees assisted with Fort Worth's successful U.S. Savings Bond drive in April and early May. But one person, Dave Cave of logistics, contributed far beyond anyone's expectations.

Cave supported the bond campaign with a special gift, his voice. Backed by taped music, Cave performed 26 concerts at the division's various locations during the three-week drive.

W.B. "Zim" Zimmerman, division vice presidentlogistics and support and chairman of the bond campaign, said Cave's singing drew attention to the drive and helped it reach the corporate goal of 90 percent participation in the Savings Bond purchase plan.

Cave agreed to perform after a scheduled band canceled. The concerts were held outdoors and near break areas during lunch periods on all work shifts.

Positive reports about Cave's singing soon spread throughout the division, bringing larger groups to the bond meetings.

Cave performed "The Star-Spangled Banner," "America the Beautiful" and other patriotic songs in keeping with the spirit of the bond campaign.

He said he enjoyed his special duty because it gave him opportunities to meet many employees, especially those in the production areas that he doesn't normally

Cave sings in area churches and sometimes works as a studio vocalist. He also recorded an inspirational music tape that was released last fall.

■ Joe Stout

Space Systems reunites U.S.-Soviet crew

Valery Kubasov vividly remembers the greatest obstacle high point" in U.S.-Soviet relations since the two to the only joint Soviet-U.S. manned space flight, 1975's Apollo-Soyuz mission.

Politics? Ideologies? Technologies? "The biggest problem was that we had three languages - English, Russian and Oklahoman," the Soviet crewman said during a recent teleconference with the three Apollo astronauts sponsored by Space Systems.

Kubasov, Vance Brand, Donald "Deke" Slayton and Tom Stafford — the Oklahoman in the group reunited in San Diego for the broadcast. The teleconference was the fifth in the "Pioneers of the High Frontier" series. Some of the questions came from four Soviet and eight American students in the studio. Others were asked over the telephone by pupils in schools throughout Canada, Mexico, Puerto Rico and the United States that were linked to the telecast.

The three-man American Apollo and two-man Soviet Soyuz spacecraft docked for several days in July 1975. (Alexei Leonov, the other member of the Soyuz crew, did not participate in the teleconference.) Stafford, the Apollo commander, called the mission "the nations were allies in World War II.

Future cooperative efforts should be the exploration of Mars and an investigation of the earth's climate, the four men agreed. "(A Mars flight) is a very expensive effort and I think it will be worthwhile to join the resources of several nations," Kubasov said. Added Brand, "There is a movement to understand our environment through the use of spacecraft. Human beings are affecting the climate and there is an intense interest in understanding that."

Space Systems was honored for sponsoring the teleconference during a reception following the broadcast. Marty K. Winkler, Space Systems vice president of research and engineering, presented a check for the teleconference sponsorship.

The Convair motion pictures and television department, including John S. Gray III, William H. Stevens, Mark S. Elder and J. Scott Crist, provided technical production and direction for the broadcast. The teleconference series began in 1986 to stimulate student interest in space exploration.

Cessna helps Navy fliers reach for sky

This is a condensation of a story by Dave Carter that appeared in the spring 1989 issue of Cessna's Directions magazine. The T-47 is the military trainer version of Cessna's Citation business jet.

CATTERED PUDDLES on the ramp are the only reminder of the Florida showers that rolled through Naval Air Station Pensacola the previous evening. Sunrise highlights the fleet of Cessna T-47As in their distinctive orange and white markings.

Overlooking the quiet ramp, the duty officer in the Eagle's Nest scans the mission board and prepares for the day's activities. Thirteen aircraft... 26 sorties. At 6 a.m. instructors and students are already gathering for briefings, with departures scheduled to start at 7:40 a.m.

F-14 squadrons. Each will participate in routine mission communications and become familiar with the elements of safety, airmanship and operations.

Benning will be the mission commander of Rocket 22, the call sign for his aircraft. Flight Simulator Doug Coleman will be the mission commander for the opposing T-47 crew in Rocket 21. He is conducting similar briefings.

The students will demonstrate against live targets in restricted airspace in the Gulf of Mexico what has been practiced for hours in radar simulators—target aspect control...lateral separation...displacing the bogey...

dogfight mode for gun and missile aiming.

The Cessna T-47A accommodates the pilot and up to three students and has two instructor positions. The 355-knot sea level penetration speed, birdproof windshield and beefed-up fail-safe airframe are valuable features for the practice sessions.

The pilots are in charge of the flying, responding to students' directions. The mission control is in the hands of Navy personnel aboard.

Airborne, Rocket 22 reaches the tactical maneuvering area over the Gulf and receives ground control intercept information from the ground-based radar

until the bogey on the T-47 radar is identified.

Emphasis is on developing confidence and self-reliance. "Make all your own decisions today — I'm not going to interrupt a lot," Benning said. "We should get lots of training in."

Rocket 22 sets up as the bogey, an "unknown" target for the T-47 in the fighter role, whose students have to determine the bogey's heading before initiating an intercept. Although it is just a training mission, the sight of a T-47 flashing by, pulling G's in an 80-degree bank while maneuvering for a Sidewinder shot up the tailpipe, is nonetheless unnerving.

Fighter and bogey switch roles. The bogey approaches rapidly and the student is suddenly the focus in an intense, complex, three-dimensional

pattern of angles, displacement turns and corrections. He feeds instructions to the pilot quickly and crisply.

As the bogey sweeps into view, hunter becomes hunted, then history, as a successful intercept is accomplished. With only a few seconds to savor success, bogey and fighter bank hard left and right for the next run. And so it goes for a typical three-hour mission.

Aboard the Citation-turned-fighter, the combined experience from prior years is being transferred to the next generation of naval aviators. The students' commitment and enthusiasm are reflected in their Cessna support team—professionals delivering a complete training system for the Navy.



A Cessna T-47 maneuvers for a "shot" as it plays the fighter role during a radar intercept training flight.

The waiting aircraft are perhaps the most visible element of a total training system provided by Cessna Aircraft Co. for undergraduate naval flight officer students en route to Navy fleet assignments.

This unique training system is managed, operated and maintained for the Navy by the prime contractor, Cessna, and its subcontractors, Northrop Worldwide Aircraft Services, Link Flight Simulation Division of CAE/Link and Northrop Defense Systems Division. The system includes radar, radar simulators, pilots and maintenance.

Marine Capt. Bob Benning settles into the briefings with his two students, both Navy ensigns. The students are radar intercept officer candidates destined for fleet

makeup angles ... intercept regression.

"The simulators are a key element of our program," Benning said. "With the exception of motion, they provide extremely realistic preparation for the students."

As the premission briefings continue, other elements of the Cessna-directed team are working smoothly. The two Northrop pilots of the single-pilot T-47 aircraft conduct their own briefing and prepare to join Navy personnel in the ready room. Outside, minor adjustments to Rocket 22's advanced radar are made.

The radar, specifically designed by Cessna, provides air-to-air intercept, search, target acquisition, tracking and ground mapping. It includes an air-to-ground mode for low level navigation, an air-to-air mode and a

Submarine veteran is Convair's model employee

As a Convair environmental engineer, William S. Malone Jr. is familiar with the world of missiles and aircraft. But having served on a submarine with the U.S. Navy for 8½ years, his heart will always be with the silent service.

To honor the memory of submariners who lost their lives, Malone decided to build a working scale model of the namesake of his last submarine, the USS *Flasher* (SS249). *Flasher*, one of World War II's most famous submarines, was credited with sinking more tonnage than any other U.S. submarine (*General Dynamics World* "Flashback," October 1988). Malone served on the current USS *Flasher* (SSN 631).

Malone's model will be 10 feet long and one foot across the beam. The remote-controlled vessel will be able to run on and under the surface.

"The first milestone in the history of a ship is the ceremony that marks the laying of the keel," Malone said. "I thought it fitting to follow Navy tradition for the *Flasher* model since the intent of my project is to honor the memory of those who made the sacrifice and left the legacy of the silent service to the present-day service."

The keel-laying ceremony was recently held at the

San Diego Submarine Base. Crew members of the old and present-day *Flasher*, both built by Electric Boat, attended. Malone served on the new *Flasher* under Capt. William S. Hughes Jr., now commander of Submarine Squadron Three in San Diego. Capt. Hughes delivered the principal remarks.

The San Diego Chapter of the Combat Submariners of World War II sent a contingent. General Dynamics was represented by Malone's co-workers and other ex-submariners who are helping him with the

project. Malone is also receiving help from several employees at Electric Boat.

Because the project is complex, the model will take from two to four years to complete. A gas engine

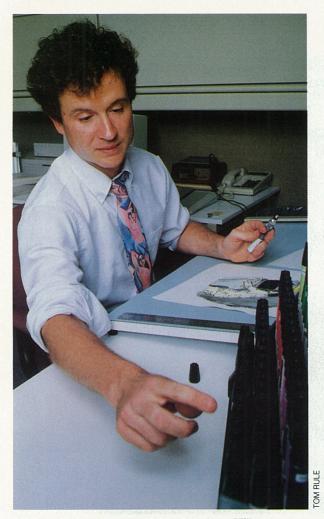


Snap Coffin, a World War II USS *Flasher* crewman, signs the keel of a model of the submarine. Looking on (from left) are Capt. William S. Hughes, ex-*Flasher* crewmen Robert P. Briggs and George Markham, Cmdr. Joel M. Weber (present *Flasher* commander) and William S. Malone Jr.

generator will power surface running.

Malone is already thinking ahead to the model's commissioning, which he hopes to coordinate with the decommissioning of the current *Flasher*. ■ Julie Andrews

JIM WHITTEN



Michael Shaw, a 30-year-old student from Hillsboro, Mo., received a \$1,000 scholarship from General Dynamics at the annual awards dinner given by the Journalism Foundation of Metropolitan St. Louis on April 25. Shaw is a graphic artist who attends the University of Missouri-Columbia.

Corporatewide crew will gather to set sail for charitable cause

For days and days and miles and miles, a hardy group of General Dynamics employees will earn their salt on the open sea.

It's all for a good cause.

A crew of 11, all but one a company worker, is preparing to sail in June in the Race for Cure, a round-trip sailboat race from Los Angeles to Honolulu to benefit the Cystic Fibrosis Foundation.

Andrew Rose, associate general counsel at Valley Systems and Pomona, will serve as captain of the Cat-Man-Do, a 40-foot catamaran. He will be assisted on the westbound voyage by Bert Sena, Pomona director of finance; Dennis McColl, engineer, and Mark Raptis, manufacturing design engineer, both of Convair; James Gucwa, Electronics master scheduler; Mark Rahhall, senior test engineer, Pomona; and one non-employee, Paul Bressman.

The crew on the return trip will be Robert Nelson, Pomona test engineer; Gregory Hock, contract administrator, and Richard Swetnam, logistics, both of Valley Systems; James Hepp, Land Systems welder; and Gucwa and Rose.

The California crew members have been spending weekends and holidays preparing the boat and themselves for the long trip. In April many crew members participated in the Newport, Calif., to Ensenada, Mexico, race. That event served as a final tuneup.

Rose said he has a personal interest in supporting the Cystic Fibrosis Foundation because a nephew was born with cystic fibrosis, the No. 1 genetic killer of children.

To assist the foundation's fund raising, Rose and his crew are seeking sponsors to provide tax-deductible contributions. The crew is asking donors to contribute \$25 to the Cystic Fibrosis Foundation. Each crewman's goal is to obtain pledges totaling \$2,500.

Rose noted that employees can use the General Dynamics matching gifts program for contributions of at least \$25, but no more than \$5,000 in any calendar year. Applications are available through human resources departments throughout the corporation. Checks should be made out to the Cystic Fibrosis Foundation and mailed to Rose at Valley Systems Division, Mail Zone 601-33.

Three employees sing out

Three employees of the Corporate Office are definitely in harmony — barbershop harmony.

Gail Anderson, Marcia Dickerson and Charlotte Moser are members of Sweet Adelines, Inc., a group of some 660 chapters comprising about 27,000 women from 10 countries who are dedicated to the promotion of barbershop music either through a chorus or quartet.

Anderson and Dickerson are members of the St. Louis Harmony Chorus, while Moser sings for the River Blenders. Dickerson and Moser also sang in quartets recently in regional competition, performing standards as well as contemporary pieces.

"This is my first year in a quartet," said Dickerson, an executive secretary who also sings with a quartet called Side by Side. "After 10 years, I finally got up the courage to get up and sing in front of an audience without 60 people next to me. I was so nervous I thought I'd fall to pieces, but I did it."

Men's groups have enjoyed more popularity, but the women's groups have come on strong, said

Anderson, a member of the chorus for 11 years and a participant in three regional championship sing-offs.

"Organized barbershop quartet singing started with the men some 50 years ago," said Anderson, senior secretary-corporate contributions. "Back then, the women were told to stay home and bake biscuits. But they decided to develop their own group and the Sweet Adelines were born."

That was 42 years ago. Now, the women in Sweet Adelines come from all walks of life. There are high school and college students, career women, housewives, grandmothers and even mothers-to-be. "There was a lady next to me on the stage one night who had her baby the next day," Anderson said.

Barbershop choruses and quartets are an original American art form, singing four-part harmony (tenor, lead, baritone and bass) without musical accompaniment. Both chorus and quartet meet at least once a week to practice not only the songs, but also the choreography that will be performed on stage

Moser and Dickerson recently sang in the Sweet Adelines regional competition in Springfield, Ill. The winners qualified for the 1990 international competition in Salt Lake City. Moser's chorus won the regionals last year and will participate in this fall's international event in Miami.

Competition is based on four categories: sound, expression, music arrangement and showmanship.

"This is really an interesting hobby," said Moser, human resources representative-corporate compensation, whose quartet, Revised Edition, won regional competition in 1981. "It's good exercise and, as you



A lucky customer is serenaded by (from left) Marcia Dickerson, Gail Anderson and Charlotte Moser while having his hair cut by Marciano Garcia.

go along in life, it certainly keeps you young. There are some women in my chorus who are pushing 70."

Small choruses are composed of 20-30 members,

while larger groups number over 100.

"I've been singing since high school," Moser said.
"But as an adult, there aren't many opportunities to sing outside of a church choir where you can get up and perform in front of people.

"We do civic performances and shows aside from the regional and international competition. You'd be surprised at the professionalism of the groups."

The River Blenders were even asked to sing the national anthem before a St. Louis Cardinals baseball game last year, an honor normally reserved for professionals.

"It's fun," said Dickerson. "I have a ball. It's the greatest hobby I could ever think of. The beauty of this is that you don't have to be able to read music. You can memorize the songs off tapes or while singing as a group."

Each of the women has her special reason for joining Sweet Adelines.

However, Moser may have summed up the main reason for the trio's involvement. "I guess it's just the ham in us," she said.

Myron Holtzman

Queen of harmony is Noble title

Constance Noble can claim the title of General Dynamics' "queen of harmony."

Noble, who is a master scheduler for F-16 spares at Electronics Division by day, has spent many evenings and weekends singing her way to royalty. She is a member of the San Diego Chorus and Savvy, a barbershop quartet that won the international competition of Sweet Adelines, Inc., last year in Houston. The winning group was officially crowned International Queens of Harmony.

Noble, a member of Sweet Adelines for 22 years, also won an international gold medal in 1972 while singing with 4th Edition, a group from Canton, Ohio. She also earned a medal by placing in the top five with High Society of San Diego in 1976.

"It's just something that gets into your blood," said Noble, who is associate director of the San Diego Chorus. "Half of my life is scheduled around this activity."

Besides singing tenor, Noble is the technician,

dresser and image-maker for her quartet. She even selected the name for the group from *Savvy* magazine, believing the group wanted to appear "current, knowledgeable and innovative."

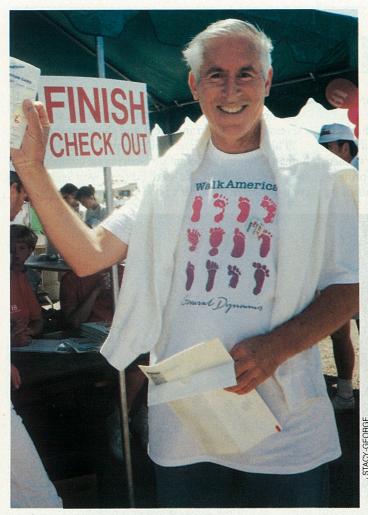
Another member of the quartet is Sandy Noble. She's not related to Connie, but her husband, Richard, is director-circuit card assembly and test at Electronics Division.

Connie, who has been singing since first grade, said she was at a wedding 22 years ago when a friend asked her to join the City of Flags Chorus. "I didn't even know it was barbershop," Noble said. "A month later I was singing in a quartet."

Her first international competition was her championship effort in 1972 in Salt Lake City with the 4th Edition. The group also gave a performance at Carnegie Hall, an occasion she says she'll never forget.

"I've been very fortunate," Noble said.

■ Myron Holtzman





(Left) Convair General Manager John McSweeny checks out at the finish line of the San Diego WalkAmerica. He and his wife Jeannette obtained over \$250 in pledges from 18 people. (Right) Some of the 761 General Dynamics employees (and one canine) who participated in the San Diego WalkAmerica celebrate. Their T-shirts were designed by Suzanne Parlett of Convair's art and editorial department.

Impressive feet raise \$94,000 for March of Dimes

HE WAR AGAINST birth defects received a boost from General Dynamics when employees corporatewide raised over \$94,000 during the March of Dimes WalkAmerica.

Participants obtained pledges to complete the walks, which were held April 29-30 at numerous sites throughout the United States. The March of Dimes will use the donations to fight birth defects. Statistics show that an American baby is born with birth defects every two minutes.

The San Diego divisions led the way for General Dynamics. Convair, Data Systems-Western Center, Electronics and Space Systems sent 761 employees to a 25-kilometer WalkAmerica. Several employees produced \$1,000 each in pledges. The San Diego divisions generated more than \$52,000 and defended their 1988 title as the city's biggest corporate fund-raisers for WalkAmerica.

Their contributions didn't end with the walk. After thieves took computers and adding machines from the March of Dimes headquarters on May 4, General Dynamics came to the rescue the next day. The company supplied six adding machines so WalkAmerica tabulations could be completed.

Perhaps the most enthusiastic of General Dynamics' fighters against birth defects work at Pomona Division's Camden (Ark.) Operation. At Camden, 172 employees, friends and relatives entered WalkAmerica. They won the "Spirit Stick" for the highest corporate participation in their walk and gathered \$6,134 in pledges.

Camden organizers tapped their employees' competitive drive to sign up walkers. "We started a campaign called Neat Feet, encouraged people to form teams within the facility and gave recognition to the top teams," said Paula Powell, a senior human resources representative who combined with Tammie Smith, secretary to the general manager, to coordinate Camden's participation.

One of the largest pledge totals by a General Dynamics division came from Land Systems. Eighty

Detroit-area employees brought in \$8,557. That figure may be topped at Fort Worth, where 175 employees and their relatives registered to walk. Fort Worth's pledges were not available at press time, but the division's goal was \$15,000.

At Electric Boat, rain during the walk held down participation. But 46 soggy employees still managed to turn in \$5,730.

Valley Systems' 57 walkers represented the largest corporate team in a 20-kilometer event that started and finished in Rancho Cucamonga, Calif. Wearing T-shirts supplied by the public affairs department, Valley Systems volunteers brought in pledges topping \$5,000.

Pomona entered 23 people in the Rancho Cucamonga walk and gathered pledges totaling \$2,243.

Employees from other General Dynamics divisions and subsidiaries participated as individuals rather than on corporate teams and raised an undetermined amount of money for the March of Dimes.

Fort Worth briefing sets stage for TQM

Fort Worth laid further groundwork for adopting the philosophy of total quality management when several hundred employees from the production department discussed TQM during a recent daylong meeting.

All management personnel from first-line supervisors to the department's vice president, Charles N. White, attended the session at a local convention center on a Saturday.

The production management team has been meeting regularly to discuss ways to improve the department. A previous meeting dealt with communications.

The production briefing sets the stage for division-wide activities that will occur at Fort Worth following total quality executive training in June. Charles A. Anderson, vice president and general manager, and each member of his staff will attend a three-day indoctrination session defining total quality as a divisionwide objective for office as well as factory functions.

Warren D. Harman, a supervisor in the F-16 inlet fabrication area, expressed his reaction to hearing about the concept: "I think TQM is a fantastic idea... I like the idea that the people doing the work should be more in control of quality and more conscious of quality."



Aircraft electrical specialists Lawrence D. Wiss (left) and Owen L. Williams check part of the 16 miles of wiring in an F-16 Fighting Falcon at Fort Worth.

The meeting included a presentation by Charles H. Hooper of the Air Force Systems Command head-quarters staff. He discussed total quality from the customer's perspective.

Industry speakers described how total quality principles have improved processes and overall quality at their companies.

Willie C. Livingston, director-TQM at Fort Worth, said achievement of total quality goals is a long-range process that will extend into the 1990s. "TQM has to become our corporate attitude," he said. "The things we are doing now are only the beginning of an extended commitment."

ACK G. NOBLE

May 1989 General Dynamics World

Statistics show Dynaflex choices

General Dynamics established the Dynaflex benefits plan so eligible employees could choose their own levels of coverage in a number of categories such as medical, life and accident insurance.

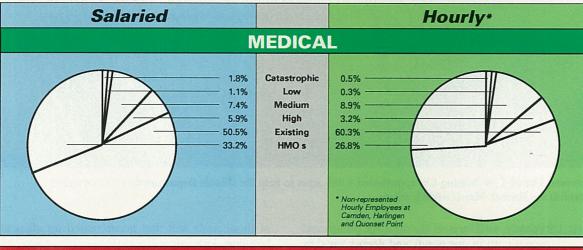
The plan took effect this year. The charts shown here indicate the choices made by over 57,600 employees eligible for Dynaflex. "We're publishing these statistics because we thought people might be interested in seeing the benefits options picked by all eligible employees," said Roger Groh, corporate director-employee benefits.

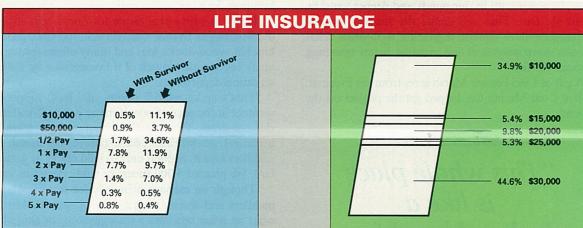
Along with medical, life and accident insurance, the Dynaflex options include three new benefits: dependent life insurance, MedAccount and Care-Account. Dependent life coverage pays benefits to an employee if a dependent dies. MedAccount and Care-Account are established by the employee through

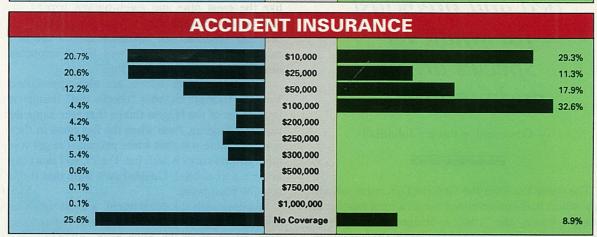
payroll deduction. MedAccount reimburses the employee for medical and dental deductibles, co-payments or other expenses such as eye and hearing examinations that are not covered or only partially covered by health care plans. CareAccount reimburses the employee for dependent care expenses. Both MedAccount and CareAccount enable the employee to use before-tax dollars, thus saving federal income tax and, in most cases, state income tax.

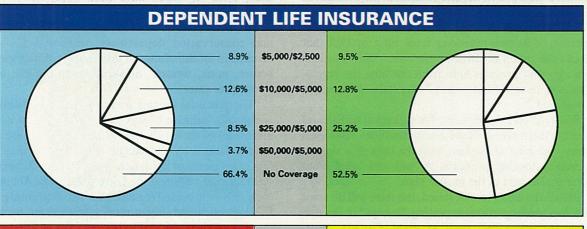
Employees can alter their Dynaflex coverage during an annual enrollment period or whenever they have a change in family status. The next enrollment period will begin this fall.

"Information on all the Dynaflex coverages will be provided again before the next enrollment period so that each of our employees can select the combination of benefits that works best for them," Groh said.









LONG TERM DISABILITY (LTD)	REIMBURSEMENT ACCOUNTS			NTS	
(Salaried Only) 16.9% 21.9%		MedA	ccount	CareA	count
60% After-Tax 46.5% 14.7%		PARTICIPATED	AVERAGE AMOUNT	PARTICIPATED	AVERAGE AMOUNT
46.5% 14.7% 70% Pre-Tax	Salaried	18.2%	\$425	2.7%	\$2,592
	Hourly	5.3%	\$280	0.6%	\$1,388



Each spring, General Dynamics donates flowers through the American Cancer Society for distribution at St. Louis Children's Hospital. Holly Gerber, a patient at the hospital, shows a company-donated jonquil to her dad, Michael Gerber.

Edwards employees answer distress signal from Special Olympics

The folks from Fort Worth Division who support F-16 follow-on flight test development at Edwards Air Force Base, Calif., are accustomed to helping the Air Force tackle a challenge.

General Dynamics employees at Edwards recently assisted the Air Force with a more unusual request: helping stage a local Special Olympics on the base.

"The Air Force had been planning this for months, but they were in need of more volunteers and donations," said Michelle Cunliffe, secretary to the Fort Worth chief of maintenance at Edwards. "The Air Force approached me about helping. I feel this is a worthy cause and is a great opportunity for our company to get involved in the community."

She found that employees did indeed want to get involved in the Special Olympics, which are athletic events for the handicapped. After enlisting the support of her supervisor, Cunliffe circulated information on bulletin boards and put together a video presentation. Forty employees volunteered to help at the event. They and other employees raised over \$250 to sponsor 25 children in the Special Olympics. The event was held May 6 at Desert High School on base. General Dynamics volunteers helped with registration, statistics, time keeping, T-shirt sales, escorting athletes and working in reception areas.

Meanwhile, Fort Worth employees at the F-l6 factory in Texas also supported the Special Olympics in a big way. About 270 turned out on a recent weekend to assist with the track and field events that have become an annual tradition in Fort Worth's community relations program.

Savings and Stock Investment Plans Annual Rate of Return for the 12 Month Period Ending: March March March 1987 1988 1989 Salaried 7.0% Government Bonds 7.4% 6.6% Diversified Portfolio 26.4% (8.9)%20.1% Fixed Income 11.9% 11.1% 10.6% Hourly Government Bonds 7.7% 7.2% 6.7% Diversified Portfolio 27.9% (9.1)%20.4% 11.9% Fixed Income 10.5% 11.1% GD Stock Closing Price \$71.87 \$53.00 \$54.25 () Denotes Negative Number

GRAPHICS BY BRUCE MCINTO

Freeman United's gift great for wildlife

Together, a brochure written by the company's communications department, highlights community activities by General Dynamics and its employees. It was one of four publications honored in this year's Community Relations Report Bellringer Awards contest.

There were a record 149 entries. *Together* was one of two publications receiving honorable mention in the seventh annual competition. Another received the highest honor, an award of excellence, and the runner-up publication was given an award of merit.

The winners were selected by the editor and publisher of *Community Relations Report*.

The following story is the first of several that will be reprinted from *Together* in *General Dynamics World*.

ANNER MARSH. Illinois Department of Conservation employees call it their crown jewel—and with good reason. In a state where 95% of the land is privately owned, the 10,000 acres of this wildlife refuge and adjacent tracts make it the largest single conservation area available to the public.

Contoured like the muscular leg of a Chicago Bears defensive lineman, Banner Marsh extends 11 miles down the west bank of the Illinois River on the Peoria-Fulton County line. For those who like a taste of the great outdoors, it offers four-star flavor.

"A lot of people go there for different reasons," says Bart Princen, director of the U.S. Department of Agriculture's nearby Northern Regional Research Center. "My main interest is birding, but I also like to know what's happening in the insect and animal world. And that's a really excellent place to observe.

"You never know what's going to pop up there. My wife and I drove in one Sunday evening and here was a ruddy turnstone — a male in its beautiful red summer plumage and black and white facial pattern. We also found a western kingbird a while ago — one of the flycatchers that's practically never seen in Illinois."

Princen, also president of the Peoria Audubon Society, volunteered his assistance for a biological study of the area in mid-1988. The two-day survey identified 88 bird species, including the endangered or threatened great egret, black-crowned night heron, brown creeper and veery.

John Ball, a conservation ranger, says birdwatchers and biologists are only a part of thousands who have visited the site since it officially opened a year ago. "Some of the best fishing and duck hunting in the state is right here," says Ball. "And it's very popular with hikers, campers, photographers and boaters, plus a lot of student groups and just plain tourists."



A muskrat nest is evidence of the wildlife that calls Banner Marsh home.

Ball says that within two years the department expects to complete its master management plan for Banner Marsh. "It's really not a marsh," he says. "Some of that, but mostly deepwater lakes, ponds, some prairie, meadows and woods."

At the nearby ranger's office, Ball used an enlarged wall-mounted surveyor's map to tell his story. "This will be aquatic vegetation. See how it will border all these mesic prairie areas — and that's woody vegetation. There's a good mix of willow, cottonwood, wild cherry and other trees.

"We've been wanting to enhance this entire wildlife and fish habitat for a lot of years and now we're able to



Freeman United Coal Mining Co. contributed 1,865 acres to help the Illinois Department of Conservation establish the Banner Marsh wildlife refuge.

do it. Ultimately, we'll turn off the drainage pumps and raise the water level in our ponds and deeper 'cuts' by about six feet. That will create the shallow, littoral shelves that allow aquatic vegetation to flourish. That attracts more waterfowl and provides better spawning grounds for fish."

A gift of 1,865 Banner Marsh acres from the Freeman United Coal Mining Co. helped get the project off the ground.

"This whole place
is like a
bed and breakfast
for whatever
species are in
midmigration."

— Conservation Ranger John Ball

The donation from the General Dynamics subsidiary, which had surface mined the area for a number of years — hence, the "cuts" — bridged a number of scattered state properties and resulted in the contiguous 10,000 acre holding.

The Freeman acreage was particularly valuable because of its two-mile-long levee built in 1912 that blocks the influx of silt from the river. "Silt smothers fish eggs and prevents light from reaching the vegetation, a waterfowl food source," says Ball. "It's our No. I pollutant!"

Walleyed pike, largemouth bass, channel catfish and even northern pike — "little eating machines," Ball calls them — abound at Banner, with the help of a supplemental restocking program. A "put and take" trout pond is also part of the master plan.

Before the water level is raised, the state will do some selective grading to create nesting "humps" in the new lakes for waterfowl such as giant Canada geese. Thought to be an endangered species only within the last few decades, as many as 12,000 now visit Banner regularly. Each year rangers trap and band the young during their flightless molting period, collecting valuable information to help them re-establish these huge birds.

Sheets of corrugated tin from Freeman's buildings have been converted into midlake earth- and stone-filled nests for the geese. "A mother goose is no nursery rhyme," says Ball. "I watched a coyote swim out to one

of those nests and that goose reared up all ready to humbug. That coyote reconsidered in a hurry!"

Banner is prime real estate for ducks migrating on the Mississippi flyway. Canvasback, redhead, gadwall, bluebill, wood ducks, teal and many others feed on the area's vegetation — much of it homegrown by the conservation department.

"That's spike weed," points out Ball, hipdeep in summer at the edge of one of many ponds. "And that's rice cut grass. The pintail feed on it. Over there is a broadleaf arrowhead...duck potato, it's called. The paddlers love it. Second only to wild celery as gourmet fare. We planted 4,000 tubers of wild celery this year.

"Though we manage primarily for waterfowl, both paddlers and divers, we get a lot of spinoff. Much of what we plant becomes a smorgasbord for shore birds like the great blue and green-backed herons, egrets, rails, sandpipers and others. This whole place is like a bed and breakfast for whatever species are in midmigration. And habitat is every bit as important as nesting — it's vital to life cycling."

The department's efforts are also appreciated by Virginia Humphries, who "checks out" Banner regularly. "One of the biggest things that ever happened to us," says Virginia, "was when the ibis came in there... and then there was that white pelican. I've got a scope and I always carry it with me. I'm 79, so I don't take as active a part as I did. Couldn't even walk that two miles into the back pond."

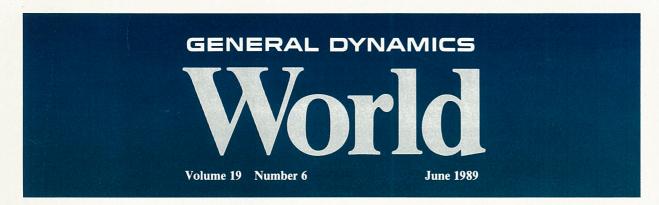
Working with the department, a local youth group built and erected 100 bluebird houses throughout the area, some of which have been inhabited by tree swallows and sparrows.

The combination of food sources, natural habitat and conservation department protection has also resulted in an abundance of furbearing animals such as beaver, mink, weasels, muskrats and even the occasional river otter.

"The potential for this area to shine in the Midwest is virtually unlimited," says Ball. "What's great is that almost all of these fish and wildlife resources are ultimately funded by the people who enjoy them. Two farsighted pieces of legislation—the Pitman-Robertson Act in the late '30s and the Dingell-Johnson Act in the early '50s—provided for an excise tax on hunting and fishing equipment. That money goes right back to develop wildlife habitats like this one. I'll tell you, there's a lot of paper work involved. But it's well worth it."

Someone else who thinks it's well worth it is Dale Walker, Freeman United's vice president of surface mining operations. Part of Dale's duties included managing the caretaking of the old Banner No. 27 mine after it closed, until the property deed was transferred to the conservation department. Dale is still a regular at Banner, but these days it's with a camera and 400mm lens.

■ Peter Connolly





Artist's concept shows Japan's fighter support-experimental (FS-X) aircraft equipped for its mission of sea-lane protection. The aircraft will be codeveloped and coproduced by Japan and the United States using the F-16 Fighting Falcon as the baseline.

Company's share in FS-X could reach over \$1 billion

ECENT ACTIONS BY THE Bush administration and Congress have cleared the way for Japan and the United States to jointly develop Japan's FS-X fighter. These events complete a negotiation and approval process that began in October 1987 when the Japan Defense Agency selected Fort Worth's F-16 as the FS-X design baseline.

Analysts bullish on FS-X: p. 2

Dr. Vernon A. Lee, Fort Worth vice president-Japan, said General Dynamics' share of the development program will be worth about \$375 million, representing three-quarters of U.S. industry's 40 percent work share.

General Dynamics is the F-16 licensor and principal U.S. subcontractor to Mitsubishi Heavy Industries, the Japanese prime contractor for the FS-X.

U.S. companies will also receive 40 percent of future work if the FS-X goes into production at the end of the development phase. Lee estimated the U.S. production share for 130 aircraft would total \$2-\$2.5 billion, with General Dynamics likely to receive about half.

"In terms of contract value and employment, General Dynamics will get at least as much work from this program as we would have if Japan had made an off-the-shelf purchase of the same number of aircraft, which was never an option anyway," Lee said.

He explained that the FS-X will be more costly to (Continued on Page 2)

Lovelace given Goddard Award

Dr. Alan M. Lovelace, corporate vice president and general manager of Space Systems, is the 1989 recipient of the prestigious Goddard Astronautics Award. Lovelace was presented the award at the recent American Institute of Aeronautics and Astronautics annual meeting and international aerospace exhibit in Arlington, Va.

The institute makes the award for notable achievement in astronautics in memory of rocket pioneer Robert H. Goddard.

Lovelace's award reads "for outstanding contributions to the field of aerospace technology and, in particular, for his leadership in government and industry in helping the United States achieve assured access to space through government and commercial launch services."

Lovelace has been with General Dynamics since 1981, when he joined the company as vice president of science and engineering. He became vice president-productivity and quality assurance in 1982 and corporate vice president and general manager of Space Systems in 1985. Before joining the company, he spent seven years with the National Aeronautics and Space Administration as deputy administrator and acting administrator. He entered federal service with the U.S. Air Force in 1954 and served in many research management positions until joining NASA.



Dr. Alan M. Lovelace and the Goddard Award, given for outstanding contributions to aerospace technology

News Briefs

Tomahawk program celebrates big day with 1,000th delivery

Convair marked an important milestone on June 1 with the delivery of the 1,000th Tomahawk cruise missile produced by the company. The ceremony was attended by Rear Adm. William C. Bowes, director-Cruise Missiles Project, company officials led by Convair General Manager John E. McSweeny, and hundreds of Convair employees who work on the program.

"The Tomahawk program has been the major product line of our division for over 15 years, generating significant employment and millions of dollars for the corporation," said McSweeny. "We have already begun work on the next 1,000 missiles and look forward to marking the 2,000th delivery in the 1990s."

The 1,000 missiles include sea-launched cruise missiles for the Navy and ground-launched cruise missiles for the Air Force. Ground-launched missiles are no longer built as a result of the Intermediate Range Nuclear Forces Treaty.

Tomahawk, a pilotless air vehicle capable of delivering either conventional or nuclear warheads against heavily defended targets, was developed by Convair in the 1970s. Since 1985, Convair and McDonnell Douglas have competed for the majority of each year's Tomahawk award.

Calling Laser Systems

Due to recent inquiries, the following Laser Systems Laboratory numbers are published for employees' general information. The area code is 619. Laser Systems Laboratory numbers will appear in updated pocket and corporate directories scheduled for distribution in October and December, respectively.

Baker, William G. (manager-engineering design and fabrication), 552-2405; Bogart, S. Locke (advanced systems program manager), 552-2407; Bradley, James N. (manager-human resources and administration), 552-2510; Freiwald, David A. (director and general manager), 552-2401; Hauck, James P. (chief scientist), 552-2403; Margalith, Eli (technical director), 552-2409; Zuppero, Anthony C. (program manager-SLC programs), 552-2404.

Laser Systems is located at 5452 Oberlin Dr., San Diego, CA 92121. Office number is 552-2400 and FAX number is 457-5132.

Pyatt gives Camden an A+

Pomona's Camden Operations drew high praise from Acting Undersecretary of the Navy Everett Pyatt when he recently visited the Arkansas facility for an overview of the Sparrow missile program.

"Only a year ago, you won the majority share of the Sparrow missile production contract," Pyatt said. "I remember not too many years ago, people were saying 'You'll never make it work down there.' But we gave you a chance and you proved that we were right and they were wrong."

Before taking his present job, Pyatt had been the Navy's assistant secretary for shipbuilding and logistics with overall responsibility for the service's weapons purchases.

While at Camden, Pyatt praised employees for "producing things competitively and winning in the marketplace." Capt. Jesse Stewart, Sparrow program director for Naval Air Systems Command, told employees that fighter pilots have a high degree of confidence that the Sparrow missile will work every time they pull the trigger.

DAN NASH



A former GD colleague who left St. Louis to work for an East Coast electronics company recently had some pointed observations.

"What's with that baseball team out there? They look like a bunch of guys who just took up the game this year. No hit. No run. No anything. Maybe you can teach them a little TQM or whatever that is that I'm hearing so much about."

Possibly he's on to something. The locals have been playing doormat to most of the National League lately, and maybe some TQM (total quality management) is in order.

TQM. Depending upon whom you discuss it with these days, it's alternately called a philosophy, a cultural revolution and even a religion. Put simply, however, it means doing those things that give the customer what the customer has a right to expect.

TQM isn't a household word yet, but it will be. The idea has been simmering on the back burner for a number of years. Now it's being moved up front as America's overseas competitors threaten to widen the trade gap and much of U.S. industry struggles with escalating costs, lagging technologies and product quality concerns.

Even in the oft-confusing climate of acronymity that cloaks the defense industry, TQM is fast emerging from the crowd.

Is there a better way to define it? Actually it's just as easily (more easily?) defined by saying what it isn't. For example, it's not:

- a "program"
- hardware inspection
- "zero defects"
- "meeting specs"
- cutting cost etc.

The fact is, it's all of those things and more. It's doing whatever it takes by EVERYONE who works for the same company to continuously increase his or her involvement and to continuously improve his or her performance to better satisfy the customer.

For a lot of us, this is going to mean some attitude adjustments, however personally agonizing. It means tossing out some long-standing preconceptions about other people and other departments—and even about the way we ourselves have performed on the job over the years. In short, it means stepping back and looking at exactly where our particular cog fits into the larger wheel of the company's business—and then doing what's necessary to mesh with everyone else

Given the tough budgetary pressure faced by the Department of Defense and the clear intent of that department to improve the products and services that it buys, it's not implausible to take seriously those who predict that there will ultimately be two types of companies in our business:

- 1. Those who adopt TQM and
- 2. Those who are out of business.

...PKC

Manufacturers honor Dow

Cushman Dow, who will retire in June as Convair division vice president and general counsel, was recognized for his long service to the California Manufacturers Association during the group's recent annual meeting. Dow received a gift in honor of his 14 years as a director of the association.

Dow and his wife, Betty, will be very much missed by the association, Chairman Richard Spees said. Dow called the group the best organization of its type with which he had been associated.



FS-X

(Continued from Page 1)

produce than the standard F-16 because it is a more complex aircraft and will have a relatively small production run.

In addition, Lee said, General Dynamics and other U.S. firms stand to gain more than the direct dollar value of their participation, since the FS-X agreement provides for technology transfer from Japan to the United States, as well as from the United States to Japan.

Japan will receive the basic F-16 data required to develop and produce an advanced derivative of the Fighting Falcon within certain protective limitations. In return, the United States will receive new technologies developed through Japanese research, such as cocured composite wing manufacturing techniques and expertise concerning phased-array radar antennas.

"The area that is most interesting to Fort Worth, as an airframe manufacturer, is the technology to produce a cocured composite wing," he said. "General Dynamics and other American companies have a lot of experience with composites, but one thing that hasn't been done, anywhere, is to successfully cocure a complete wing with all the parts cured and bonded together as one unit.

"This technology has been under development in Japan since the early 1980s and will be applied to the FS-X and proven through evaluation and testing. We're very encouraged about the potential of this technology, partly by the fact that the Japanese are so confident of its success that they aren't carrying a backup approach for the wing."

General Dynamics will manufacture two sets of wings for FS-X prototypes, a work share that ensures complete transfer of the cocuring method. The FS-X agreement provides full rights to this technology and others developed for the program in Japan.

Lee said the technology to cocure wings would be a significant advantage in future aircraft programs.

"We also believe there's a good chance that we'll gain useful information about Japanese technical and management style through the joint program," Lee said. "The Japanese have a long record of success in the area of designed-in product reliability, which has emerged as a high priority in the U.S. defense business."

Lee said General Dynamics will also have the opportunity to learn more about Japanese concepts that provide for a relatively quick design-to-production cycle, as compared to usual U.S. standards.

FS-X design features could also be applied to future Fort Worth-produced versions of the F-16. "For example, the program is going to develop a new, larger wing that could have applications in future U.S. Air Force F-16 configurations," Lee said. A similar enlarged wing planform has been studied in Fort Worth's Agile Falcon program.

"It's unlikely that any FS-X hardware components will be incorporated directly into the Fighting Falcon, but some of the basic design may be very applicable," Lee said.

A small group of engineers and other personnel will begin work on the FS-X at Fort Worth almost immediately. The number will eventually reach several hundred people, Lee said.

An initial cadre of nine Fort Worth employees will be assigned at Mitsubishi in Nagoya, Japan, in the near future. The number is expected to reach 70-80. A much smaller number of Japanese engineers is expected at Fort Worth.

Japan is providing all the funding for the FS-X program and will receive all the aircraft. The planned configuration is specifically tailored to Japan's sea-lane protection mission. "We believe that the FS-X will fulfill its role very effectively, making a substantial contribution to the mutual defense interests of the United States and Japan," Lee said.

The FS-X differs from the F-16 in several ways. In addition to the larger wing and increased use of composites in a number of areas, it will include a longer fuselage, inlet-mounted canards similar to those on the AFTI/F-16 Advanced Fighter Technology Integration test aircraft, and other structural changes.

The FS-X will incorporate a Japanese radar and other Japanese avionics systems, and will be powered by the upgraded engine that will drive U.S. F-16s beginning in the early 1990s. Other U.S. companies are expected to work with Japanese firms in producing some of the subsystems.

Four flying prototypes and two ground test prototypes will be constructed in the development program. The schedule calls for first flight in 1993 and first production deliveries in 1997.

General Dynamics development tasks include overall wing design participation in Japan and manufacture of two pairs of prototype wing boxes at Fort Worth. The company will also design, develop and manufacture all prototype units of the wing leading-edge flap at Fort Worth; design, develop and manufacture all units of the aft fuselage section at Fort Worth; perform extensive avionics integration involving hardware and software in Japan and Fort Worth; and modify and provide two sets of the F-16 Avionics Intermediate Shop, including work at Fort Worth and at Electronics in San Diego.

In addition, the company will participate in almost all other areas of FS-X design at Mitsubishi in Nagoya.

The FS-X agreement resulted from an arduous process of government-to-government and industry-to-industry negotiations conducted for more than a year. "The agreement stands on its own as a beneficial arrangement for our country, our industry and our company, while also meeting the needs of Japan," Lee said. "It is expected to be the model and precursor for other codevelopment programs between the United States and Japan."

Lee pointed out that Mitsubishi Heavy Industries and General Dynamics have a lot in common, although Mitsubishi is considerably smaller. The Japanese firm manufactures commercial aircraft components, space launch vehicles, tanks, submarines and missiles, and is producing the F-15 Eagle under license to McDonnell Douglas.

"It's possible that our companies will find some other areas for cooperation," he said.

The General Dynamics team in Japan needs members who are fluent in Japanese. One of Fort Worth's initial activities on the FS-X program will be to identify a pool of Japanese-speaking employees for potential assignment there.

Persons who speak the language and who have engineering or other skills that may be required are encouraged to contact Fort Worth's engineering personnel section at (817) 777-2659.

■ Joe Stout

Wall Street rates FS-X as triple-A

Wall Street is bullish on the FS-X. In interviews conducted after the Senate cleared the way for development of Japan's FS-X fighter, aerospace industry analysts agreed with Paul Nisbet of Prudential-Bache Securities, who said that "it's a very favorable deal for General Dynamics and for the U.S. government as well."

Nisbet added: "As a result, there'll be an upgraded F-16 and the flow of yen into the United States. And we're not giving away a damn thing. After all, the Japanese have been building the F-15, another sophisticated aircraft, with McDonnell Douglas for years."

Wolfgang Demisch of the Union Bank of Switzerland was similarly upbeat: "From GD's perspective, it's a win-win situation. GD gets paid to do research and at the end can sell its rejuvenated airframe." Demisch also observed that "as far as the U.S. military aircraft industry is concerned, it's not the FS-X that should be its concern, but the FS-Y follow-on around the year 2005. We must be sure to maintain our leadership by continued investments so that we won't be half a generation behind."

Other advantages of the joint venture were noted by Jerry Cantwell of Wertheim Schroder & Co.: "It's a big plus for GD's image as a major technology-driven partner. It gives the company other potential business opportunities and the inside track on promising Japanese technologies. Japan is a major trading partner and strategic ally. GD has a chance to become a more important part of this relationship."

■ George Salamon

Company smooths road home

RETURNING HOME FROM an overseas job assignment sounds easy. No new languages to learn. No new customs to absorb. No new cities to get lost in.

However, repatriation isn't so simple. From such mundane chores as shipping belongings back home to such mentally unbalancing matters as returning to a changed country, coming back can be as tough as going away.

General Dynamics is smoothing the road home as much as possible for its international employees. Perhaps the most important aid is finding jobs for those overseas with return rights to their last U.S. locations with the company. Return rights are earned by serving with the company at least one year before beginning an international assignment.

"General Dynamics is sending a lot of people overseas who would not normally expect to go, such as production and engineering people (for F-16 fighter and M1A1 tank assembly facilities)," said Mike

the Army's Abrams tank program in West Germany. The company covers hotel and rental car expenses for families who need several weeks to find permanent lodgings in the United States or to buy an auto. Fix-up money may be paid for those coming back to a house they had rented while out of the country. Many repatriated employees and their spouses also attend a one-day seminar that focuses on readjustments to the United States.

The seminar proved to be particularly useful to David Smith, his wife Francie and daughters Beth and Becky, who returned to Fort Worth in December after 4½ years in Brussels, Belgium.

"It helped us deal with stress and to communicate about things that can get lost in the cracks," said Smith, a financial specialist in the A-12 Advanced Tactical Aircraft program. "It was an opportunity to share your situation with other folks' situations."

Repatriation programs such as the seminar serve another important purpose besides easing relocation.



Mike Armour, John Inkelaar and David Smith (from left) are back at Fort Worth after recent overseas assignments.

The Emperor's Palace in Japan is one of the sights that will greet General Dynamics employees working on such overseas assignments as the FS-X fighter.

Armour, a Fort Worth logistics specialist in product support field service. He served $2\frac{1}{2}$ years in Beni Suef, Egypt; his wife, Anne, joined him for the last 10 months. "I think it's especially important for these employees to know that GD is committed to placing you upon your return to the U.S."

The company is succeeding in meeting those commitments. In 1988, General Dynamics placed 140 of the 142 international employees—nearly 99 percent—coming home with return rights. They came back to jobs that carried equivalent or greater responsibilities than the positions they held before going overseas. Jobs were not found for two people who would have been laid off whether they had been on domestic or international assignments.

General Dynamics' expanding international business has taken more than 600 workers, plus spouses and dependents, on long-term foreign assignments. Another 150 are serving in short-term international jobs. The company operates in about 70 locations in 25 foreign countries.

"I was really pleased with how I was treated by the company when I came back," said one of the 1988 returnees, John Inkelaar, a chief construction engineer at Fort Worth who spent nearly four years in Ankara, Turkey, along with his wife Lin and daughter Darlin. "It was nice to know that people here were taking care of us."

Taking care of the unique needs of returning personnel involves more than job placement. "The company also sent me real estate packages and fully explained the tax situation while we were preparing to come back, which is great," said Dennis Sherry, a Land Systems senior field engineer who worked with



"The company's efforts play a critical role in attracting current domestic employees to fill General Dynamics' expanding international programs," said Arch Rambeau, corporate vice president-human resources.

However, there are certain things that no seminar can do. One of the don'ts, warn repatriated employees, is bore your relatives, friends and co-workers with overseas stories. "Everyone is interested in your experiences for about five minutes," Smith said. "Then you see that look in their eyes that says, 'Here we go again.'"

Dave Lange



Student John Amato and teacher Pam Mamsch chip away during a fossil hunt.

Chicago students dig visit to Material Service

Science students from the Chicago area toured Material Service Corp.'s Thornton Quarry recently in search of ancient marine fossils dating back to the Silurian Period, 395 to 430 million years ago.

The seventh through 12th graders were winners of the Chicago Non-Public School Science Exposition held at Chicago's Museum of Science and Industry. The Thornton Quarry Tour Award winners were selected for their outstanding exhibits in conservation, earth science, fossil exploration and fossil history.

During the Silurian Period the Midwest was covered by a vast tropical inland sea that contained reefs similar to those found today in the South Pacific and the Caribbean.

The Thornton reef began as a small mound of animals. Wind and waves washed shell debris down the sides of the mound, forming steeply dipping flank beds. Through time more animals colonized, producing a large reef of more than a mile.

Geologists from all over the world began to visit the quarry after the core of the reef was discovered a few years ago.

The tour started at the quarry observation booth, where the group saw the enormous size of one of the largest active commercial limestone quarries in the world

Quarry Foreman Jim Goldberg led the group of winning students, their parents and teachers through the quarry. He explained how Material Service mines limestone.

The group looked into the primary crusher that is fed by 85-ton trucks. Once unloaded, the stone is chewed into pieces no larger than nine inches in diameter. The primary crusher is capable of crushing up to 3,000 tons of stone an hour.

The group then went to work chipping at the rock pile. The students discovered many molds and casts of prehistoric life, including those of coralcups, branchiopods and crinoids.

Pam Mamsch, a science teacher at St. Tarcissus School in Chicago, gathered samples for her students.

"I think having the students look at these rocks and having them compare what they see with the pictures in books helps sharpen observation skills," she said.

Thornton Quarry, which has been operated by Material Service since 1938 and has been producing stone since before the turn of the century, will produce many tons of stone as well as provide educational opportunities for several generations to come.

■ Peter Stamos

World

Published by: General Dynamics Corporation Pierre Laclede Center, St. Louis, Mo. 63105

Manager of Internal Communications: Dave Lange

Contributors: Julie Andrews, Graham Gavert, Don Gilleland, Myron Holtzman, Dean Humphrey, Jack Isabel, Jerry Littman, George Livesay, Bruce McIntosh, Jack Price, Tom Rule, George Salamon, Chris Schildz, Peter Stamos, Joe Stout, Joe Thornton, Ed Williams



People attending the B-24 reunion seek shade under the wing of "Diamond Lil," one of two Liberators flown to Fort Worth for the occasion. The aircraft were displayed alongside a B-52 at Carswell Air Force Base.

B-24s bring back memories at 50th anniversary

The Consolidated B-24 Liberator was the mainstay of the U.S. bomber offensive during World War II. A total of 18,188 Liberators was built from 1939-44, more than any other type of aircraft in U.S. history. Crewed by 10 men, the Liberator was heavily armed with .50-caliber machine guns mounted in turrets and side windows.

T WAS A COMBINED veterans celebration, aviation exhibition and family reunion when thousands of people associated with the B-24 Liberator gathered in Fort Worth recently to mark the World War II bomber's 50th anniversary.

The Fort Worth reunion was the first of two held this year to commemorate the B-24's first flight in 1939. The second is scheduled for September in San Diego, where the B-24 was designed and initially flown.

Nearly 10,000 B-24s were built by Consolidated Aircraft Corp. and Consolidated Vultee, predecessor companies of General Dynamics, in Fort Worth and San Diego. B-24 assembly was also offloaded to three other companies, establishing a still-unbroken record for U.S. combat aircraft production with more than 18,000 airplanes.

One of the more than 100,000 U.S. and allied pilots who flew the Liberator during WWII was Stanley C. Pace, General Dynamics chairman and chief executive officer.

Pace, a pilot and flight leader in the 465th Bomb Group of the 15th Air Force, was shot down on his 39th combat mission, parachuted behind enemy lines and spent nine months in a German hospital and POW camp before being freed in May 1945.

The Fort Worth celebration included a historic occasion when the two Liberators known to be airworthy, "Diamond Lil" and "Delectable Doris," were displayed side-by-side at Carswell Air Force Base, across the runway from the Fort Worth Division factory that once produced B-24s and today makes F-16 Fighting Falcons.

A third Liberator, a Fort Worth-produced B-24J, is being restored by the Collings Foundation in Kissimmee, Fla., assisted by a grant from General Dynamics. The foundation hopes to have the aircraft in flyable condition in time for the San Diego reunion in September.

Nostalgia prevailed at the Fort Worth event, which included exhibits such as a B-24 gunner's turret and a cockpit mockup that sparked recollections for many of the attendees. Displays featured World War II flight gear and squadron insignia, and almost all the activities had a musical background of 1940s swing.

Fort Worth Mayor Bob Bolen opened the reunion by proclaiming May 17 "B-24 Liberator Day" in Fort Worth. "We truly feel that this is a military town because we work together to keep America free and safe for the future," he said, referring to the presence of General Dynamics and Carswell Air Force Base in Fort

Worth. "This proclamation offers thanks to everyone who designed, built or flew B-24s."

The reunion also rekindled old friendships. John Shiver Jr. of Atmore, Ala., and Dominic Dibenedetto of Philadelphia, who flew 50 B-24 combat missions together, coordinated their attendance at the event. "The B-24 was a great airplane because it always got us home, although not always in the best of shape," Shiver said

Retired Maj. Gen. Lew Lyle of Hot Springs, Ark., who commanded a B-17 group during the war, attended the reunion because of a chance meeting with a B-24. "Somebody landed a shot-up Liberator at our base in England and we repaired it," he said. "It was faster than the B-17s at low altitude, so I flew it for about a year and used it to direct our bombers on their way to the continent. I loved it. It was fun to fly."

Many attendees such as Cliff Peterson of Winterpark, Fla., told stories about being shot down and bailing out of B-24s. "The left side of the cockpit was blown out, and we went into a spin at about 18,000 feet," Peterson said. "We couldn't get the bomb bay doors to open hydraulically, so we had to hit them and kick them."

Peterson spent the remainder of the war as a German prisoner. "I ran into a fellow from my unit last night who didn't know I'd survived until he saw me at this reunion," he said.

Many of the attendees described the B-24 as "an ugly airplane on the ground, but a beautiful airplane when it was flying."

Ground crew member Charles Finn of Boston recalled working to keep the B-24s in top condition. "Sometimes we worked all night to get them back in the air the next day," he said. "If they came back with two engines shot out, you had to replace all four engines because of the extra wear and tear on the two good ones."

Employment at the B-24 plant in Fort Worth peaked at about 30,000 people, including many wives, daughters and sisters of servicemen.

General Dynamics sponsored an exhibit at the reunion and provided funding to the Confederate Air Force for the display of "Diamond Lil."

The International B-24 Memorial Museum in Pueblo, Colo., sponsored an extensive display, including a plaque with a fitting epitaph:

Though not sleek and handsome in shape or looks, this sturdy-built airplane proved itself to those who built it, flew it or knew it.

■ Joe Stout

Veteran gives thanks for dollar-bill bomber

Fort Worth received a number of interesting phone calls during the recent B-24 reunion. One caller, Reuben D. Duke of San Antonio, Texas, wanted to thank the employees of Consolidated Vultee for their generosity to his Army Air Forces unit in World War II.

In 1944, Fort Worth employees pasted dollar bills to at least one Liberator as it traveled down the assembly line as a contribution to whatever squadron received the bomber.

A total of \$2,928 was collected and eventually transferred to the 564th Squadron, 389th Bombardment Group, of which Duke was a member at a base in England. Duke said the money was used for a morale-building party to mark the 564th's 200th mission over Germany.

"If some of the people are still there, I want to thank them for their supportive gesture," he said. A few employees from the World War II era are still at Fort Worth, though the number is

Duke said he flew several missions in the B-24 "Delectable Doris," which was in Fort Worth for the reunion.

■ Joe Stout

GD 'historian' finds a use for all his stuff

Roger Cripliver's wife, Doris, finally got an answer to her perpetual question: "What are you going to do with all that stuff?"

Her husband provided many of the photographs and much of the information for the General Dynamics display at the recent B-24 50th anniversary reunion. His contributions included one of the display's most popular features, a pictorial story of the B-24 manufacturing process.

Cripliver, a logistics specialist who is 70 years old, has been with Fort Worth since 1947 and is considered the division's unofficial historian. He has studied aviation and been a collector since 1927, when Charles Lindbergh made the first solo flight across the Atlantic Ocean.

Cripliver specializes in the history of aircraft built by General Dynamics and its predecessors.

Joe Stor

Community program takes 'em out to the ballgame

Mia Gray, a seventh-grade student in St. Louis, figured something bad was in store when the school office summoned her.

But far from being in trouble, Gray had been singled out for something special. She was one of 10 outstanding students picked by their teachers to attend a recent St. Louis Cardinals baseball game, courtesy of General

"When I was called to the office, I thought I was in trouble," said Gray, who attends Brittany Woods Middle School. "But I was surprised to know that I was selected for doing something good."

General Dynamics makes a habit of doing something good for people of all ages by sending groups of 10 to Cardinals games as guests of the company. The effort is part of General Dynamics' community work in St. Louis.

"Each year, several local nonprofit organizations such as The Dream Factory (for seriously ill children), Big Brothers/Big Sisters, Boys Hope and Girls Club of St. Louis are treated to a Cardinals game," said Bill Pedace, corporate directorcommunity relations. "It's our way of sharing a pleasant experience with those who might otherwise never have the opportunity to see a game."

Corporate employees nominate groups for consideration and then act as hosts if their group is selected. Deborah E. Holmes, senior secretary, decided to nominate a group of underachieving students such as Gray who showed significant improvement in school.

"They are rarely recognized for their efforts, even though they try very hard," Holmes said.

A recent group from the other end of the age spectrum came from the All-Sports Club of the Covenant House, a residence for self-sufficient elderly. Meyer Ruban, the 85-year-old president of the All-Sports Club, said his group was impressed that a major cor-



A group of students and General Dynamics' Deborah E. Holmes (right) talk baseball at a St. Louis Cardinals game at Busch Stadium.

poration would devote the time to do something for the elderly.

"It certainly is a wonderful gesture to do this for a group of people who normally wouldn't be able to enjoy

something like this," said Ruban. There are approximately 250 members in the club. They range from ages 65 to 90.

For many in the company-sponsored groups, the experience provided a chance to attend their first major league baseball game.

"I'm glad to be here, but I don't understand baseball," said Rosalind White of Brittany Woods. "But it did

make my parents very proud of me (to be selected)."

Said one of the Covenant House representatives, Helen Sosna: "I've been a big Cardinal fan for years, but this is the first game I've been able to go to. I've only been able to watch them on television before this. It's nice of General Dynamics to think of us."

Most of the Covenant House members reminisced about the past and the great players they had seen... Ruth and Gehrig, Hornsby and Frisch, Lazzeri and Bottomley. The youngsters in Holmes' group dwelled on current stars...Coleman and Smith, Gooden and Strawberry, McGee and Guerrero. Despite the difference in years, however, the two groups had a single bond—their love of baseball and the game's rituals.

"I feel good knowing that a big company knows something about me," said Tyrone Foster,

a ninth-grade student. "I like baseball. Ozzie Smith is my favorite player. But today, I'm the star because General Dynamics says so. This really makes me want to go back and work real hard."

Myron Holtzman

Feeding the needy

Gravine dishes it out in Scranton

The following story is reprinted from Together, an award-winning booklet published by General Dynamics to highlight the community activities of the company and its employees.

ON'T FORGET THE LOOK in their eyes," Monica Gravine reminds us as we are leaving Scranton, Pa. Gravine does not need to be reminded. She sees that look every Sunday when she works as a volunteer at the St. Francis of Assisi Kitchen, dishing out lunch to 200 people in this city of about 80,000 that has seen better days.

So has most of the St. Francis of Assisi clientele. "They represent blue-collar America down on its luck," says Louis Dinner, former chairman of the kitchen's board who used to operate a pants factory here. "Many of the people you see here today worked in plants that are now closed. Some are retired. They often live in the boarding houses scattered through the city and come here for the companionship as much as for the hot meal."

The companionship in the bright, airy dining room is expressed by nods of recognition, by a quick "how ya doin'?" and by the exchange of bits of news. There isn't much conversation. The chatting comes from the volunteers behind the counter, volunteers comprised of retired housewives and high school students, Boy Scouts and Girl Scouts and Monica Gravine, a payroll clerk at the General Dynamics plant that supports Land Systems Division facilities in Michigan and Ohio.

Gravine cannot forget the downward glance or the mix of sadness and shame in the eyes of families with children, the parents shuffling behind the children eager to get at the food. She sees it in the eyes of the unemployed janitor, the widow of a miner, and the the woman who walks four miles for the lunch of chicken, potatoes, vegetables, salad and pie. "I am a religious person," Gravine says,

"and I realize how fortunate I am. What

happened to these people can happen to anyone. Every time I see them, I say to myself, there, but for the grace of God, go I."

Monsignor Constantine Siconofoli of the Holy Family Rectory and founder of the kitchen first noticed "these people" in the mid-1970s when unemployment in

part-time maintenance worker and two part-time secretaries. About 150 volunteers, eight to 10 on any given day, set up the line, dish out the food and clean up afterward.

Siconofoli, the members of his board and the volunteers are a powerful fund-raising force. The bulletin board listing the host of the day, which requires a \$100 contribution, rarely fails to display the name of a Scranton area couple or someone a

Scrantonian wants to re-

member. Siconofoli says

he has tapped into his

community's spiritual



Aviation artist Cunningham joins aces he illustrates

The American Fighter Aces Association recently awarded the title "Honorary Ace" to Bob Cunningham, manager of marketing concepts at Fort Worth, to recognize the aviation artist's work in documenting the history of aerial combat in paintings, books and film.

Retired Lt. Col. John L. Sublett, a World War II fighter ace and outgoing president of the Aces, bestowed the honor on Cunningham at the group's annual convention May 20 in Colorado Springs, Colo.

The title "ace" usually describes pilots who have scored five or more aerial victories, which makes Cunningham's award a rare one in the organization.

Cunningham's best-known work, "Aces High," is a compilation of biographies, original illustrations and photographs chronicling renowned aces and their aircraft from World War I to the present. In preparing "Aces High" and "Out of the Sun," a film about aerial combat, Cunningham interviewed famous aces from many nations, including both sides in World War I and World War II.

"Out of the Sun" won seven cinema awards, including best documentary at the fourth International Military Film Exhibition in Lausanne, Switzerland, in 1984. Bob Simons of Fort Worth's multimedia group was codirector and editor.

Cunningham recently updated the book "Aces High"

for the third time to include additional information on aerial battles in Vietnam and a brief summary of the Fort Worth-built F-16's combat record in the Middle East and Southwest Asia, where pilots have used it to score more than 50 victories with no losses.

He has also designed three stamps for the U.S. Postal Service: to commemorate the 50th anniversary of commercial aviation in 1976, to mark the 50th anniversary of Charles Lindbergh's trans-Atlantic flight in 1977 and to celebrate the sport of soaring in 1980.

Several paintings by Cunningham are permanently displayed at the U.S. Air Force Museum in Dayton, Ohio, and in museums in the Netherlands and Vene-

Cunningham joined General Dynamics in 1955 and was an engineering specialist in advanced design before transferring to marketing in 1980. He is a Fort Worth native and holds a bachelor of fine arts degree in painting and advertising from Texas Christian Univer-

In a congratulatory telegram sent to Cunningham in Colorado Springs during the Aces convention, David J. Wheaton, corporate vice president-program development and planning, said Cunningham is "a friend of fighter pilots all over the world."



Bob Cunningham puts finishing touches on a painting that depicts the 352nd World War II combat victory of Erich Hartmann, the highest scoring ace of all time.

Cessna's red carpet



A work group in Pomona's machine shop gathers for their morning meeting to discuss their individual responsibilities for daily production goals. Talking things over are (from left) Supervisor Charlie Villaloboz, Organization Specialist Arthur Howard and Machinists Juan Patlan, Robert Thorpe, Jimmy Gallimore and Bruce Glass.

New technology: Pomona people

VERY DAY CHARLIE VILLALOBOZ gathers his people on the shop floor for an informal meeting. Anything is open to discussion as long as it concerns the work on the floor. The conversation always centers around one question: "What is keeping our group from getting our best work done today?

This is an example of a new technology that is creating breakthroughs at Pomona. It is a technology that could increase productivity, develop new business opportunities, and improve competitiveness.

The kev element in this new technology is people

The catalysts are members of the division's Organization Effectiveness Services group. Their job is to help create and encourage productive working relationships among employees that lead to higher productivity and improved quality.

"Companies can get so engrossed in improving technology and equipment that sometimes they forget about integrating the human element," said the group's chief, Bob Howery. "People are the human capital which provides a high leverage for increasing productivity."

By focusing on the human relationships that affect performance, the group's specialists work at resolving problems in communication, team building and other areas where human performance is a factor.

The group provides team building sessions and coaching to work groups within the division, including the general manager's staff and small departments.

"My role as a coach is to get people talking to each other in a way which gets them to focus on solving problems," said Dan Plumer, a specialist with the group. "We coach them to structure their conversation

on achieving results."

One aspect of the coaching role involves the resolution of "breakdowns." A breakdown is a barrier between individuals or groups that prevents them from achieving their objectives.

"From our perspective, breakdowns are potential opportunities," said Dr. Arthur Howard, another of the specialists, "because they highlight all of the factors involved. This gives us the opportunity to identify critical difficulties which keep workers from performing their best. Our role is to help management clarify these difficulties and ensure a constructive dialogue.'

Managing breakdowns and coaching team building sessions have evolved to another role—that of coaching the division's efforts in total quality management. TQM focuses on examining the work process itself and redesigning the process to make it more cost effective, to improve quality, and to help it meet the needs of its "customers" in a more effective way.

"We coach them to view other departments and groups within the division as customers and to consider how their actions impact those customers," Plumer said. This helps the TQM groups become more receptive to the needs of those customers they serve.

Emphasizing the human factor in the workplace recognizes that a work force is a resource and an investment, which requires the same attention given to investments in new technology and equipment. "All of our efforts are geared directly toward division and corporate goals, such as improving our competitive position or acquiring new business," Howery said.

is rolled out to greet 400 Citation operators

When Citation business jet owners buy their aircraft from Cessna, they expect special treatment. And they aren't disappointed.

In the past three months alone, Cessna has conducted conferences that have reached nearly two-thirds of the Citation owners operating in 59 countries.

Nearly 400 customer personnel sat in on the recent annual operators conference in Wichita, Kan., the largest attendance at any conference to date. In addition to technical seminars and product support briefings, they heard an address from shuttle astronaut Steven R. Nagel.

The Wichita meeting was preceded by a sales symposium at which the new Citation V was introduced.

Other Citation conferences were held in France, Africa and Australia.

Highlighting the Wichita meeting was the announcement that two \$1,000 Cessna scholarships have been established at the Pittsburgh Institute of Aeronautics in the name of Joseph J. Solomon, who recently retired following 13 years as vice president-product support.

Texans top golf tourney

Fort Worth and Data Systems-Central Center played hosts to the first (revived) Corporate Golf Tournament recently, and even though the players from the two teams were the big winners, torrential spring rains prevented any home-course advantage.

The storm had left water ankle- to knee-deep at Squaw Creek Golf Course, which is operated by Fort Worth's Recreation Association. But the golfers took it all in stride and it was decided to play the tournament at "The Cliffs" at Possum Kingdom Lake, about 70 miles west of Fort Worth.

Data Systems' Dave Richardson won the individual competition with a 75 and was named corporate champion. Two Fort Worth employees were next, Jeff West at 78 and Paul Norris at 79.

West and Norris joined teammates Greg Myers, Steve Wagner and Don Bruner to capture the five-man team championship for Fort Worth with a score of 317. (The highest team member's score was dropped.)

Electric Boat's team, consisting of Peter Stefanski, Gary Chaney, John Ward, Brian Cummiskey and William Zembruski, placed second at 352.

West and Myers also won the two-man best-ball competition with a 72.

Other teams were from Corporate Office, Camden, Land Systems, Data Systems and a composite group from the West Coast divisions.

EM/OS upgrades to begin this month

A corporatewide upgrade to the Electronic Mail/ Office Systems network will begin this month and continue into September on a site-by-site basis.

Changes will improve functionality and flexibility. They will require some adjustments "where the fingers meet the keyboard," according to Rik Drummond, corporate manager for EM/OS, Data Systems Division-Central Center.

"Increasing user sophistication and business requirements have resulted in continued growth in EM/OS capacity, capability and the number of users," Drummond said. "Enhancements with the forthcoming upgrade will include indexing, time management, site optional word processing, additional filing options and distributed directory services."

A corporatewide project team with representatives of each division was established to define user needs and smooth the transition of the EM/OS upgrade.

"Awareness and involvement by the user community are considered essential for a successful upgrade," Drummond said.

Key elements of the transition are documentation, including a functional comparison "was/is" card, a quick reference guide, a menu screen card and several workbooks; support training to prepare EM/OS administrators in providing user support; and a preview announcement that will be sent to all EM/OS users, Drummond said.

"This upgrade will strategically position EM/OS as the enhanced foundation for corporatewide communications," he said. "It will support General Dynamics' efforts to become more cost and technologically competitive."

EM/OS was adopted in 1982 and services 16,000 employees, or about 25 percent of the company's professional force. The system is a tailored version of a Digital Equipment Corporation product.

WORKS CHARTIONS CHARTONS In that

Marsha Scott, an employee involvement representative at Fort Worth, finished fifth overall in the Greater Fort Worth Corporate Spelling Bee. She's shown studying a spelling book that helped her complete 12 rounds of the competition. Meanwhile, three Land Systems employees reached the finals of the Olsten Great Grown-up Spelling Bee in Detroit. Joseph A. Murphy, a systems and procedures analyst, finished sixth, the best performance of the three. Carvel W. Stoddard, a security officer, and Nancy O. Byrd, a senior engineer, also reached the finals.

Pomona launches bid for Sea Lance award

Pomona has embarked on a unique effort leading to its proposal to produce the Navy's new Sea Lance antisubmarine missile system. It marks the first time the division and other bidders have been asked to submit selected sample hardware along with their proposals to qualify as a second-source manufacturer.

Sea Lance is a long-range standoff weapon that combines a missile and a government-furnished Mark-50 torpedo. The weapon can be launched from either submarines or surface ships equipped with vertical launchers. It travels at high speed and altitude and releases the torpedo by parachute near the target.

The system was designed and tested by Boeing. Last year, before Boeing completed full-scale engineering and development, the Navy invited other contractors to become the second-source producer of the weapon. The first contracted effort is for qualification followed by a low-rate production contract. Competition begins in 1994.

Pomona General Manager Sterling V. Starr has

targeted Sea Lance as a "must-win" second-source opportunity for Pomona Division and has appointed Division Vice President Chuck Mimbs to direct the multimillion-dollar program.

Submitting sample hardware to qualify as a second-source manufacturer puts a new twist on the traditional proposal process, according to Mimbs. "It means making a little more investment during the proposal phase for what otherwise will be a 'build-to-specs/build-to-print' system," he said.

Second-sourcing is not new to division production. Sparrow has been a second-source program for more than 20 years, first at Pomona and now at its Camden Operations. Both of Pomona's principal systems, Standard Missile and Phalanx, have been second-sourced to other companies. Sea Lance provides an opportunity to regain some of that lost business.

According to program officials, the Navy may purchase as many as 3,500 units. If successful, Pomona could be contracted to build between 1,600-2,000 units.

Savings and Stock Investment Plans Annual Rate of Return for the 12 Month Period Ending: April April April 1988 1989 Salaried Government Bonds 6.5% 7.5% 7.3% 28.6% Diversified Portfolio (7.9)%26.1% Fixed Income 11.9% 10.6% Hourly Government Bonds 6.8% 7.5% Diversified Portfolio 26.6% Fixed Income 11.8% 11.0% 10.6% GD Stock Closing Price \$64.00 \$54.87 \$55.87 () Denotes Negative Number

Fort Worth flier rebuilds, repaints, restores Russian plane

About the time that the first F-16s painted like Soviet MiGs left Fort Worth for Nellis Air Force Base, Nev., another Russian aircraft with a General Dynamics connection appeared in the skies over North Texas.

Neil R. Anderson, Fort Worth's director of international market development and one of the original F-16 test pilots, completed the successful first flight of a rebuilt Yak-11. He flew the Korean War-vintage Russian trainer/attack airplane on May 1 after three years of restoration.

The Yak-11 saga began about three years ago when Anderson, his sons and a friend—his principal partners in the project—spotted an advertisement offering the remains of five Yakovlev fighters in a newspaper's classified section. The ad inspired a weekend trip to McAllen, Texas, on the Mexican border, where the Anderson family purchased the better parts of several different airplanes.

Anderson described the parts as "a pile of scrap metal." The next three years were spent cleaning, priming, reassembling and, in some cases, redesigning the various components. "Since a few things were missing, we bought some parts from vintage aircraft supply houses," Anderson said. "We also incorporated newer technology wherever we could to improve the overall safety."

For example, the original air-actuated brakes were replaced with a modern hydraulically operated system. Si Robin, an Anderson family friend and partner in the project, redesigned the landing gear.

Anderson obtained Russian technical and flight manuals for the airplane and had several translated. "It was obvious, on occasion, that the translation was not perfect," he said. "It was also interesting to try to figure out what all the Russian symbols meant on the various parts."

The Yak restoration involved work on the wiring, tubing, fuel tanks, flight controls and instruments. The aircraft's fabric skin was replaced, and the seven-cylinder Russian radial engine was rebuilt and proven through numerous engine runs and adjustments to ensure its safety.

Finally, after approximately 1,500 hours of labor, the aircraft was completed and submitted for arduous examinations by a licensed aircraft inspector and then a representative of the Federal Aviation Administration. It passed both checks and was FAA-certified as an Experimental aircraft, at Anderson's request.

In April, the Yak was painted in authentic three-tone blue camouflage reminiscent of the Air Force's Aggressor F-16s, which are used to simulate MiGs in air combat training.

Anderson returned the Yak-11 to the air on May 1 in a nearly perfect first flight that even included several barrel rolls. His wife, Jean, later said she could see his grin all the way from their Cessna 210, which was used as a chase plane.

Anderson, who formerly served as Fort Worth's chief test pilot and director of flight evaluation and engineering, has an FAA letter that certifies him to fly any type of high-performance piston-engine airplane. He has flown at least 214 different types of aircraft, including numerous jet fighters.

The Andersons' Yak was built in 1954 in Czechoslovakia and flown operationally by the Egyptian Air Force. It saw combat in South Yemen in 1963 and spent about 20 years in desert storage before being purchased by a Texan and transported in pieces to McAllen.

Anderson said he plans to display the airplane in vintage aircraft shows and eventually trade it for a British Sea Fury, which will be his next restoration project. He won the Reno Unlimited Class Air Race flying a modified Sea Fury in 1983.

■ Joe Stout



Fort Worth's Neil Anderson with his rebuilt Yak-11 painted in authentic three-tone blue camouflage. He described the aircraft as a "pile of scrap metal" when its restoration began three years ago.

Company awards four-year grants to eight students

Eight high school students, seven of whom are children of General Dynamics employees, have won company-sponsored four-year college scholarships.

Six of the winners have been awarded National Merit Scholarships. Two have received National Achievement Scholarships. The scholarship program is administered by the National Merit Scholarship Corporation.

The National Merit Scholarship winners:

Julie M. Barter of Fort Worth. She is the daughter of Stephen W. and Mary K. Barter. Her father is a test pilot at Fort Worth. Planned major is physical science.

Keith A. Sundstrom of Fort Worth. He is the son of David E. and Charlotte R. Sundstrom. His father is director-research/engineering at Fort Worth. Planned major is engineering.

Frank T. Sronce Jr. of Fort Worth. He is the son of Frank T. and Betty L. Sronce. His father is a security specialist at Fort Worth. Planned major is computer science.

Gregg L. Kasten of Covina, Calif. He is the son of Peter F. and Georgia-Ann L. Kasten. His father is an electrical engineer at Valley Systems. Planned major is premedicine.

John H. Petrangelo of Greene, R.I. He is the son of Dale H. and Linda M. Petrangelo. His father is a senior planner at Electric Boat. Planned major is electrical engineering.

Titi M. Liu of Diamond Bar, Calif. She is the daughter of Hsun K. and Tenly Liu. Her father is a software engineering specialist at Data Systems-Pomona. Planned major is political science.

The National Achievement Scholarship winners:

Michael J. Brown of Bonita, Calif. He is the son of Michael M. and Lorraine A. Brown. His father is a human resources specialist at Electronics. Planned major is astrophysics.

William O. Nash of Vienna, Va. He is the son of Anthony and Deborah M. Dupree. Planned major is mechanical engineering.

The four-year scholarships provide a minimum of \$1,000-\$3,000 a year, depending on the cost of tuition and the family's financial status.

General Dynamics sponsors six National Merit Scholarships each year for children of employees. The company also awards two National Achievement Scholarships to black students who live near a General Dynamics facility and who need not be children of employees.

Electric Boat selects 12 children of employees for college scholarships

Twelve children of Electric Boat Management Association members recently received scholarships totaling \$12,750 from the association.

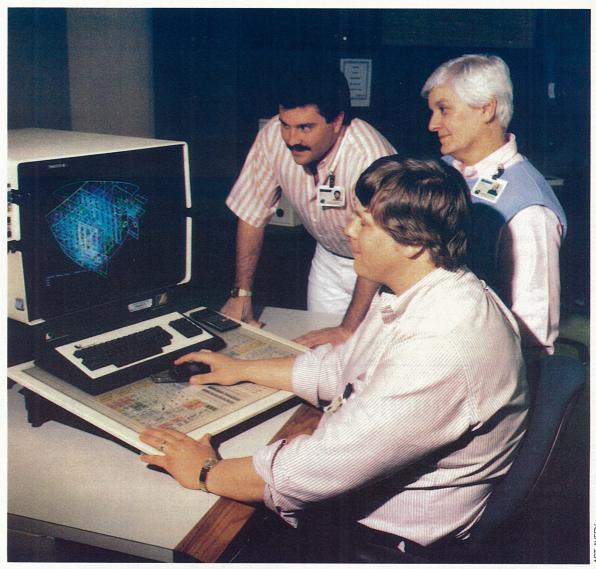
Sixty children applied. Academic achievement and extracurricular activities determined the winners.

First prize went to Matthew W. Zembruski, son of B. William Zembruski, hourly employment chief. Matthew is ranked first in his class of 191 students at Stonington (Conn.) High School.

Nancy Fichtman, daughter of John F. Fichtman, engineering specialist, won the second prize. She is sixth of 245 students at East Lyme (Conn.) High School.

Tying for third prize were Denise L. Chernansky, daughter of Robert J. Chernansky, engineering specialist; and John H. Petrangelo, son of Dale H. Petrangelo, senior planner. Denise is sixth of 243 students at Ledyard (Conn.) High School. John is third of 370 students at Coventry (R.I.) High School.

The eight runner-up prizes were awarded to: Christopher C. Capotosto, son of Dr. Augustine Capotosto Jr.; Scott A. Cummings, son of John M. Cummings; David M. Fantarella, son of James R. Fantarella; Kathryn Gilstad, daughter of Gerald Gilstad; Deborah Lewis, daughter of Dr. Burton Gischner; Megan R. McGuire, daughter of Richard F. McGuire; Meg M. Schmidt, daughter of Paul W. Schmidt; and Dean P. Sisco, son of Anthony F. Sisco Jr.



John Marriott (standing, left) and Barbara Sherman look on as Steve Majcher demonstrates the capabilities of Computervision.

Seawolf design brings new kind of 3-D vision to Electric Boat

LECTRIC BOAT DIVISION is meeting the challenge of designing the *Seawolf* submarine by using a new system called Computervision.

Seawolf, the U.S. Navy's newest class of nuclear attack submarines, offers a unique opportunity to design with one eye to the future and the other on the past. Electric Boat, which has been selected to build the lead ship in the class, will enhance the capabilities of a submarine built for the 21st century while incorporating lessons learned from constructing the SSN 688 and Trident classes, the latest subs in operation with the Navy.

Computervision makes that kind of flexibility possible.

In the past, construction drawings were done by system, but Electric Boat builds by piece. In other words, the division uses modular construction techniques, building smaller parts in shops and assembling larger components before installation aboard the submarines. "The system drawings sent to the shipyard had to be cut and pasted or redrawn before they were usable to the trades," said Robert W. Baseler, manager of the division's computer-aided design services.

With Computervision, the drawings are conceived with construction techniques in mind. Drawings contain information beyond an outline on the computer screen

"A model or a drawing has intelligence if a portion of it—for example, a plate—can be selected and then be made to provide additional information, such as a part's position in relation to the entire submarine, its material makeup, thickness, location, and the type of any of its welds," said John E. Marriott, a senior draftsman.

An intelligent electronic drawing becomes a comprehensive source of information—a centralized point—that can be easily updated and made available via computer to the various users. "An intelligent electronic model supplies consistent information to any trade in the form required by that trade," Baseler said.

"In addition to providing usable drawings to the trades, Computervision also enables us to see prob-

lems on the screen and fix them before the drawings are ever sent to mock-up," said designer Steve B. Majcher. "The capability of going into a 3-D data base, looking at an electronic model from any angle, and finding interferences — for example, where a pipe

"Computervision enables us to see problems on the screen and fix them before the drawings are ever sent to mock-up."

— Designer Steve B. Majcher

and a plate occupy the same space — rather than going into the shipyard and first constructing the mock-up is invaluable."

Designer Doug H. Witt noted an additional advantage. "Development of a model—the initial input of the intelligent data—provides a common, consistent data base for everyone in the shipyard and at the other site offices to work from.

"Computervision is getting Electric Boat to the point where CAD (computer-aided design) is linked to CAM (computer-aided manufacturing). Automated manufacturing of parts is the ultimate capability."

The change from hard-copy drawings to the computerized capture of information represents a transformation in how people approach their jobs. "It involves a team of people looking at how their own work affects things down the line," Witt said.

Developing designs to be producible—designing with a concern for construction—requires rethinking the methodology for building submarines. Computervision is the tool for that effort.

■ Christine L. Wilson

M1A2

It's what's inside that counts

Outnumbered by Warsaw Pact tanks, NATO forces in Central Europe rely on a qualitative edge — an edge the new M1A2 Abrams tank is expected

to provide for the foreseeable future.

The U.S. Army's main battle tank now in use, the M1A1 Abrams, is regarded by armor experts as one of the most formidable tanks in the world. Its armament, armor, electronics, mobility and reliability have set the standard in tank technology.

The M1A2, however, will be equipped with Block II upgrades at Land Systems

Division's Sterling Heights, Mich., plant, making it even more formidable. Initial deliveries to operational tank units are scheduled for early 1993.

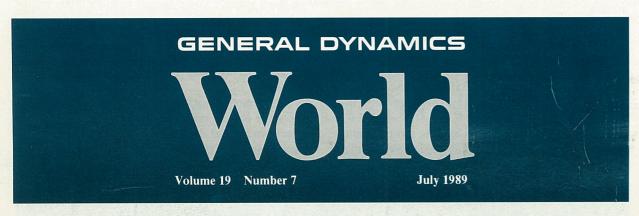
What does that mean for General Dynamics?

If all options are exercised, the contract could eventually be worth \$297 million to the

worth \$297 million to the company. In addition, company officials are negotiating with the U.S. Army for a second multiyear contract that will continue Abrams tank production through 1996.

"The continued evolution of the mature M1A1 makes possible cost-effective combat improvements that will enable tank crews to continue meeting world-

wide threats projected for the 1990s and beyond," said (Continued on Page 2)



The M1A2 Abrams will look almost identical to the M1A1 model

ATA source selection sets good example, customer says

The A-12 Advanced Tactical Aircraft being developed by General Dynamics and McDonnell Douglas already stands as a model of an efficient source selection

process, according to Capt.
William R. Morris, the
Navy's top contracting
officer for aviation systems.

Morris, assistant commander for contracts at Naval Air Systems Command in Washington, D.C., discussed the A-12 source selection process and the teaming arrangement on the program during a recent visit to Fort Worth.

"I think that we can look back on the source selection of the A-12 as one of the examples of how efficiently and timely we can get action done," he said. "From the start of the process on the A-12, it took us basically four to five months to complete the full-scale development negotiations and discussions.

"That's about a third to a half less time than it takes on most programs of this size. The contractor teams and the Navy both worked the issues and got at them right away. We both had a goal and we worked very hard to get there."

He added that General Dynamics and McDonnell Douglas seem to be working very well as a team.

"As we get into this world of teaming arrangements, we have to ask ourselves, 'How is this marriage going to (Continued on Page 2)

Louisiana site to support Super Collider

Space Systems Division has selected Hammond, La., as the site for production of superconducting magnets for the Superconducting Super Collider.

Capt. William R. Morris

Louisiana Sen. J. Bennett Johnston made the announcement June 28, signaling a General Dynamics commitment to produce the magnets in Hammond if the company wins a preproduction contract. Contrac-

See Current and Comment: p. 2

tors for preproduction are expected to be announced later this year by the Universities Research Association acting for the Department of Energy.

Johnston, who chairs the Senate subcommittee that oversees funding for the Superconducting Super Collider, said the decision by General Dynamics represents "one of those rare opportunities that can have a tremendous, long-term impact on jobs and economic development for our state."

Added Space Systems General Manager Dr. Alan M. Lovelace: "We are excited about the possibility of establishing a production site in Hammond for magnet production. Our site selection team, state and city officials have worked very close and very hard in finalizing an agreement. Hammond meets all of our requirements as an attractive community with a skilled labor force."

General Dynamics would lease and occupy a 210,000-square-foot facility to manufacture the superconducting magnets. Space Systems would produce and deliver 20 magnets over the 2½-year preproduction phase. The 55-foot-long, 11-ton magnets would be shipped to the Superconducting Super Collider site in Texas. Contract value for this phase of the program is more than \$20 million.

Employment to support preproduction will total just over 100. If Space Systems is successful in winning a production contract, employment could number 300-600.



Camden, Navajo assembly facilities opening this summer

The Pomona and Valley Systems divisions are expanding into new plants this summer.

Pomona's Camden (Ark.) Operations will start final assembly and testing of Standard Missile at Highland Park, a 27-acre multibuilding site in East Camden. Meanwhile, Valley Systems dedicated a 30,000-square-foot plant on June 30 at the Navajo Agricultural Products Industry Industrial Park near Farmington, N.M.

Highland Park is a renovated former Navy facility built during World War II. Government-furnished tooling is expected in July and missile guidance, control and airframe hardware later this year. The facility is scheduled to deliver missiles complete with warheads and propulsion rockets early next year. Pomona previously provided guidance and control systems and portions of the outer shells. Navy weapons stations completed assembly.

The Valley Systems facility was built by the Navajo Tribe and is being leased to General Dynamics for 15 years. The plant will employ 150-200 people by 1991.

New Convair site selected

Convair will locate a facility in Imperial, Calif., to support Tomahawk cruise missile production. A 65,000-square-foot plant on a six-acre site will be built next to Imperial County Airport and will be leased to Convair for 10 years with two five-year options.

The facility is scheduled to begin operation early next year. It will employ a minimum of 100-125 people.

Computer comforts shown

Material Service and Marblehead Lime employees who use video display terminals learned more comfortable ways to work during a recent exposition sponsored at Material Service's main office in Chicago.

Attendees were introduced to ergonomics, the science of making the workplace safer and more effective.

Representatives from the office facilities, personal information systems and safety departments discussed and demonstrated various products and techniques. Participants practiced ergonomic techniques using demonstration workstations.

Better jobs await graduates

Eighteen Electronics Division students recently graduated from a special training program offered by the division in conjunction with the San Diego Community College District.

The former electronics assemblers completed the 260-hour course, which qualifies them for upgrade to electronics test technicians. Test technicians test and troubleshoot production electronic assemblies.

"This program is a part of our overall effort to stabilize our work force by satisfying our requirements for higher skilled jobs within the division," said Paul Bokros, vice president-operations at Electronics. "Sixteen of the students have been offered positions as test technicians with Electronics and the others will be eligible for openings expected within a few months."

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Abrams

(Continued from Page 1)

Robert W. Truxell, Land Systems vice president and general manager.

The Abrams series has consistently maintained operational readiness rates above 90 percent, considerably higher than previous systems.

However, even as M1A1 crews demonstrate the tank's performance to potential customers around the world, threats of the 1990s dictated the need for upgrades in the tank's armament, armor and electronics. The M1A2 answers that need. It will be even more lethal and more survivable than its predecessor.



SUPER COLLIDER SUNDAY. If you could see the players, it would really be worth watching.

That's what they're saying about opening day at the underground 53-mile racetrack called the Superconducting Super Collider (SSC).

The big event will occur sometime near the turn of the century. And while no one has yet been named to throw out the first proton, things are on schedule for start of construction next year on the world's biggest atomic physics machine in Waxahachie, Texas, just south of Fort Worth.

GD's Space Systems Division, with some 12 years' experience in the building of superconducting magnets, is moving along in step with the program. Last month, they announced the selection of Hammond, La., as a production site should they win a contract later this year from the Department of Energy. The award would mean construction of 20 11-ton, 55-foot-long magnets during the SSC's 2½-year preproduction phase.

Billed as a quantum leap to explore matter and energy, the SSC is ultimate high tech. Bunches of protons are separated from hydrogen atoms and beamed on two counterrotating paths in an oval tunnel about 175 feet underground. Some 10,000 magnets steer the protons (which tend to straightline travel), bending them around the curves of the track. The two clusters (each containing about 7 billion protons) whiz past each other at velocities approaching the speed of light. Assisted by bombardments from a way-station radio frequency accelerator, the protons make about 3,000 laps a second around the 53-mile track.

When they reach optimum velocity, the opposing beams of protons are then directed by the magnets into a head-on collision. Physicists say that these collisions, which will occur in threestory-high computer detection halls, could mimic the approximate energy level that accompanied the "Big Bang" theorized to have given birth to the universe.

All in all, it's heady stuff. Space Systems hopes to build about 50 percent of the huge magnets that will steer the protons around the track. The division has already constructed 29 magnets - in world-record sizes as large as 350 tons and as long as 92 feet — for the Department of Energy. The Hammond, La., operation would get the Space Systems effort up and running and bode well for a promising SSD/SSC future.

How important is the SSC program to America? Speaking to an industry group in Washington on June 21, GD Chairman and CEO Stan Pace called it "an expression of the combined will of our government, industry and academia" that will "advance our understanding... of matter, strengthen our competitiveness in the international marketplace," and "enhance our standard of living and quality of life as we enter...the 21st century."

The exterior of the M1A2 will change little from the M1A1. The commander's independent thermal viewer will be the only noticeable difference. The viewer will give the commander a 360-degree surveillance capability independent of the gunner, making it possible to designate a target with a push of a button and slew the main gun and the gunner's sight into line with a potential threat.

But what will go inside will greatly improve the new tank. Land Systems' research and development in vehicle electronics, survivability and robotics will play an important role in developing the M1A2. Other improvements will

mature through contracted research and development in armament and survivability.

"The M1A2 program will ensure that the Abrams tank continues its dominance of the battlefield," said R. Gary Diaz, director-Abrams engineering program. "Building on the established M1A1 base will make it possible to deliver qualitative, cost-effective improvements to the M1 series."

Crew protection will remain the U.S. Army's highest priority. Armament and armor upgrades are classified,



Jack E. Vettori, a kit builder in subassembly at Land Systems' Sterling Manufacturing Plant in Sterling Heights, Mich., selects a routing wire for installation in an M1A1 Abrams tank.

but it can be said that enhanced armor will provide protection against more powerful weapons and increase the probability of survival. The lethality of the M1A2's armament will also benefit substantially from updates in target acquisition and fire control, along with dramatic improvements in command and control systems.

Electronic data bus technology similar to that used on fighter aircraft also will be introduced in the M1A2.

However, electronics form the backbone of the tank and will provide more reliable information. New displays will be provided for the commander, gunner and driver. Electronic sensors and systems will im-

prove driving, target identification and communications. The driver's thermal viewer will improve his vision

night or day, in good weather or bad. And an eye-safe laser range finder will improve fire control by upgrading the ability to penetrate fog and other adverse battlefield conditions.

Other improvements will include an engine digital electronic control unit, a position navigation system, a driver's integrated display and an intervehicular infor-**■** Don Gilleland mation system.

Armor makes M1 tops, author says

has to prove itself king of the killing zone - it will represent \$20 billion well spent."

Orr Kelly, "King of the Killing Zone"

Kelly's conclusion in his recently published book on the M1 Abrams results from years of researching the U.S. tank program. The veteran Pentagon reporter reviewed documents, interviewed generals, spoke with the soldiers in the field and participated in mock battles and field maneuvers.

"In some respects the M1A1 is clearly superior to any tank in the world today," Kelly said during a recent telephone interview. Kelly covered the military while a reporter for the Washington Star and U.S. News and World Report.

Kelly noted that the M1 represented a major break with traditional U.S. tank development and combined several new technologies. It was by far the most ambitious tank the Army had ever planned, he said.

"I hesitate to say the M1A1 is the best tank ever produced because of peculiar needs by each country," he said. "But I am particularly impressed with its armor. That is the key to the tank's superiority."

Kelly said it was impossible to overestimate the

"If the Abrams never fires a shot in anger - never importance of the armor breakthrough, which he reports was stumbled upon by a British scientist and has given the American tank its superiority over its

> "By surrounding the crew of the M1 with special armor and by protecting them in the event their own ammunition is hit, the tank designers did much to assure that Abrams crews will fight bravely," Kelly wrote. "There seems little doubt that on a tank-fortank basis, an American crew in its Abrams has the advantage over the Soviets in their T-80."

> Kelly also said the revolutionary turbine engine was a significant breakthrough on the M1A1. On the negative side, however, he said the engine has a very high fuel consumption compared with the heavier diesel engines used in other tanks.

In the book, Kelly said that in the long run, General Dynamics' acquisition of Chrysler Defense, which designed the Abrams, benefited the Army and the tank program. "The company put more money into research than Chrysler did, and it has spent its own money to buy new machinery that has resulted in a significant improvement in the quality of the tanks," he wrote. **■** Myron Holtzman

(Continued from Page 1)

work?" he said. In the case of the A-12 team, "I have never seen such enthusiasm and a more positive approach to the successful development of a Navy aircraft. There's no doubt in my mind, after seeing your approach to development of the A-12, that it's going to be successful."

The A-12 full-scale engineering development contract was awarded to the General Dynamics/McDonnell Douglas team in January 1988. The principal A-12 program office is in Fort Worth. The aircraft will be assembled in Tulsa, Okla.

Morris also discussed the overall government procurement procedure in a speech to Fort Worth's National Management Association chapter. He acknowledged the contracting difficulties caused by increased oversight, inflationary pressures and other

"More laws are coming, more regulations are coming," he said, explaining that these are often questioned by the government and contractor during negotiations for new programs. "Our discussion is not going to make them go away.

"We make it difficult for ourselves sometimes...we spend an awful lot of time debating things that aren't particularly pertinent to our business together. We're very interested in eliminating things that are unnecessary and that just add to the cost, but we don't need to complain about things that neither of us can do any-**■** Joe Stout thing about."





SPRINGTIME IN PARIS. The best from the East and the West met during June's Paris Air Show, where General Dynamics displayed the F-16 Fighting Falcon and the Soviet Union's Su-27 Flanker made its Western debut. Test pilots arranged guided tours for each other as a gesture of friendship. Left, General Dynamics test pilot Bland Smith climbs the ladder to the cockpit of an Su-27, followed by Sukhoi Design Bureau chief test pilot Viktor Pougachev. Right, Pougachev sits in an F-16C cockpit as Smith explains the instrument panel.

Prototype line puts SINCGARS assembly to test

BY THE TIME ELECTRONICS Division starts building the Army's Single Channel Ground and Airborne Radio Systems (SINCGARS) later this year at its new facility in Tallahassee, Fla., the fully automated assembly line will work right the first time.

This is neither wishful thinking nor an impossible dream. Computer simulation designed the line, and the manufacturing process will be tested in San Diego on a prototype of the Tallahassee line.

The simulation and test make up just one part of Electronics' winning strategy in capturing the SINCGARS business, a program that could produce up to 400,000 radios.

"From the beginning we knew we were going to set up a streamlined, low-cost, high-volume manufacturing facility," said Bill Widmer, SINCGARS deputy program director. "Since we were going to a continuous flow manufacturing line — a new concept for us — and

doing it at a distant facility in Tallahassee, we felt we needed to proof the concepts near our knowledge base here in San Diego."

SINCGARS is the first totally computer-integrated manufacturing program at Electronics with linked systems from the production work cell up to division-level planning. General Dynamics engineers and subcontractor personnel developed the software for the programs and integrated it with existing systems.

The prototype line contains five robotic stations, conveyors and other conventional equipment necessary to assemble circuit cards to military specifications. Software controls all machinery and material handling devices. Minimal manual work will be required.

Reducing manual handling increases reliability. High yields and low defect rates generate a high production rate.

"We are building the radio with high reliability in mind," said Gene Heizer, vice president and program director. "This is a key part of the program. Under manual methods, a circuit card assembly might be handled over 20 times. The more times a part is handled, the greater potential for damage."

Inventory is tracked through material resource planning. Computers will signal the robot operator when part inventories run low. "Parts are ordered from the supplier in tubes so they can be loaded into the robots when they come in, without handling them," said Chuck Ebeling, the program's director of operations. The high volume and low mix of inventory lends itself to just-intime delivery of parts to the assembly line.

Stand-alone tests of the prototype line prove that the line performs as designed, and pilot production has begun on the first radios that will be tested for reliability and performance. The first deliverable radio is scheduled to leave the Tallahassee facility in the summer of 1990.

■ Julie Andrews

Sparrow missiles share nest with F-16C Falcons

The F-16C Fighting Falcon has added beyond-visual-range missile capability with the AIM-7 Sparrow after recently completing two successful test firings at Eglin Air Force Base, Fla.

The launches complete the certification flight test program required to adopt AIM-7 as an F-16C weapon. The AIM-7 is an all-weather, all-aspect, medium-range radar missile produced by Pomona and Raytheon. The missile will complement the F-16's capability to carry and launch the AIM-120 Advanced Medium Range Air-to-Air Missile.

In the first launch, an F-16C fired a Sparrow from 12,000 feet looking down on an oncoming target 10

miles away at 5,000 feet. The missile carried no warhead but destroyed the target on impact.

During the second test a few days later, an F-16C at 20,000 feet fired up at an oncoming target 12 miles away at 30,000 feet. The supersonic missile passed within lethal distance of the target.

AIM-7 capability for the F-16C has been developed under a program funded by General Dynamics and Westinghouse. In the F-16C application, the missiles are guided with Pulse Doppler Illumination provided by the aircraft's Westinghouse APG-68 radar.

Sparrow capability has also been integrated with the F-16A and B aircraft in the U.S. Air Force's Air Defense

Fighter program. In the F-16A application, the missile is guided with a separate Continuous Wave Illuminator integrated with the F-16A's existing APG-66 fire control radar and antenna.

The F-16C AIM-7 flight test program was built on data gathered in the previous F-16A and B tests. Since October, more than eight AIM-7 firings have been made from F-16As and Bs at varying speeds, altitudes and gravity forces.

Two international F-16C customers have already contracted to receive AIM-7-capable aircraft.

■ Joe Stout

Cessna, Fort Worth combining talents

Fort Worth, Cessna and CAE-Link are mixing a unique blend of commercial and military capabilities in a proposal for a new comprehensive system to train Air Force pilots of large utility aircraft.

The three have teamed to compete for the Air Force's Tanker Transport Training System. Fort Worth is leading the effort and is responsible for the overall integration of capabilities and program elements. The proposed trainer aircraft provided by Cessna will be a derivative of the T-47A used for undergraduate flight officer training by the U.S. Navy.

Allen Corp. of America, a CAE-Link subsidiary, is responsible for analysis and development of the overall instructional program.

"The major training device in the ground-based training system, the operational flight simulator, will be proposed as a derivative of the Citation simulator currently used in commercial training for business jet pilots," said Fort Worth's Tim Roels, overall program director for the team. "The ground-based training system components will be provided by Link Training Services, Link Flight Simulation and Allen Corp."

World

Published by: General Dynamics Corporatio Pierre Laclede Center, St. Louis, Mo. 63105

Manager of Internal Communications: Dave Lange

Contributors: Julie Andrews, Graham Gavert, Don Gilleland, Myron Holtzman, Dean Humphrey, Jack Isabel, Jerry Littman, George Livesay, Bruce McIntosh, Jack Price, Tom Rule, George Salamon, Chris Schildz, Peter Stamos, Joe Stout, Joe Thornton, Ed Williams



Jeff Wells and friend, a sculpture of a stegosaurus, pose for the camera.

Electric Boat worker's art breathes life into dinosaurs

INOSAURS ARE BIG BUSINESS. Sheets and towels, models and movies, articles and theories... all evidence that the fascination with prehistoric animals is far from extinct, though the subjects of that fascination may be.

For Jeff Wells, a first-class sheet metal worker on the second shift at Electric Boat and owner/creator of Wells Dinosaur Haven, dinosaurs are more than a business. They're a creative passion.

Wells is an artist whose life-size dinosaur models are displayed outdoors in his parklike Dinosaur Haven. Wells is also that rare kind of artist: He has found his artistic subject, expresses it well, and enjoys practicing his craft. He also likes his job, enjoys the friendship of his coworkers, and finds numerous connections between his work at Electric Boat and the sculpting he does on his own time. In fact, he credits his work in the shipyard as having a tremendous influence on his art.

"I have a bachelor of fine arts degree from the Philadelphia College of Art, and they taught me to paint nice, acceptable paintings, the kind you hang on the walls of your living room or dining room," Wells said. "But I quickly got bored with that kind of drawing-room art. Too clinical. Too lifeless. And it wasn't communicating anything to anyone.

"So now I sculpt dinosaur heads and people come and buy them to hang in their homes and their offices and their restaurants."

Wells' passion for dinosaurs began about 14 years ago, and since then he has gained a following that is steadily growing. He participates regularly in art shows and can find buyers for any new work added to his inventory, which includes iguanas, chameleons and turtles as well as dinosaur heads.

"People tend to get this idea that artists are eccentric by definition," Wells said when asked about the connection between his art and his job. "But I toe the line every day at EB. And I get inspired from working in the shipyard. To me, all the submarines under construction form incredible patterns and shapes, better than anything I've seen hanging on any museum wall. Walking into an unfinished Trident is like walking into a vaulted cathedral. It's that impressive to me."

Before coming to EB seven years ago, Wells said his art lacked finish. "I was not a disciplined enough craftsman yet to render a durable, fully realized piece. But my work at EB has given me an education in how to work with structural steel, how to weld joints, how to use different pieces of metal to their best advantage.

"I used to throw my outdoor dinosaur sculptures together in a few hours — and they fell apart. Now my work holds up well under any weather condition. My very first dinosaur is right near the entrance to the park, and it serves as a reminder of how far I've developed."

In one corner of the park, a series of enormous steel girders are in position, the skeletal beginning of Wells' most ambitious dinosaur sculpture, a 42-foot-long tyrannosaurus

"It'll take me years to finish that one," he said. "But by working on all those different boats at EB, I've learned how to keep several projects going at the same time. EB has taught me to be disciplined and to be a careful planner. These sculptures take a lot of patience. It's painstaking work, using so many different materials with different characteristics."

Most of his dinosaur sculptures have a steel foundation. The body parts are formed from wire and window screen, over which is placed a fiberglass material that Wells treats with a resin to make a hard surface. Details such as scales and teeth are added before the final painting.

Wells has arranged his creatures in family situations in two places in the park. In one spot, small dinosaurs wrestle on the ground. In another, a baby dinosaur leaps to nip at its mother's back.

"Kids are tuned in to dinosaurs from a very early age and the commercial market has picked up on it," Wells said. "Whether dinosaurs will be as popular five years from now remains to be seen. But I wouldn't be surprised if they are. Like those strong flowers and vegetables you count on, dinosaurs are hardy perennials."

■ Graham Gavert

San Diego divisions spearhead campaign to assist retarded

The General Dynamics Corporate Office recently presented the Association of Retarded Citizens in San Diego with \$150,000 on behalf of San Diego's Space Systems, Convair, Electronics and Data Systems-Western Center divisions.

"We have had a long and successful relationship with ARC in San Diego for many years, and we intend that it should continue to thrive," said Dr. Alan M. Lovelace, Space Systems general manager, while presenting the ceremonial check. "We recognize that it is important for all citizens of our community to put their talents to work. ARC, your accomplishment in giving all people the dignity of work is unsurpassed and we congratulate you."

The money will go to the organization's QUEST campaign, which is the first major private sector funding program that has addressed the association's capital needs. The General Dynamics gift is the largest single QUEST donation, according to Dr. Richard Farmer, the Association of Retarded Citizens' executive director.

"QUEST will allow us to continue services and provide physical facilities that are needed to maintain services and respond to a disabled population in San Diego that will grow by 25 percent in just 10 years," Farmer said.

The association's principal support has previously come from state, federal and private sources, and could only be used for direct services, not physical expansion. The General Dynamics gift will be used to expand a work center near General Dynamics' Kearny Mesa plant.

General Dynamics' long association with the group began with the donation of a used van in the 1950s. The employee Con-Trib clubs have been major supporters since the 1970s. The company is also a customer of the organization, which builds shipping crates for Electronics and sharpens drill bits for Convair.

Charles H. Lloyd, vice president and controller of Space Systems, serves on the association's board of directors and was recently elected secretary.

The Association of Retarded Citizens-San Diego is a non-profit organization that provides developmentally disabled children and adults a variety of programs. These services include work and adult activities, educational and trade training, residential programs and social and support services.

■ Julie Andrews

San Diego State given \$100,000

The Corporate Office has pledged \$100,000 to San Diego State University's new Gateway Complex on behalf of General Dynamics' San Diego divisions. The facility will support programs in entrepreneurial management, the American Language and Japanese Studies Institutes and television and satellite learning programs.

About 400 San Diego State graduates — more than from any other school — work throughout General Dynamics. In San Diego, 333 employees receive tuition reimbursement for attending the school — 25 percent of all tuition-reimbursed students. Twelve cooperative education students from San Diego State are working in the San Diego divisions.

Savings and Stock Investment Plans Annual Rate of Return for the

	Annual Rate of Return for the 12 Month Period Ending:			
Salaried	May 1987	May 1988	May 1989	
Government Bonds	6.9%	7.5%	8.1%	
Diversified Portfolio	22.3%	(7.5)%	29.9%	
Fixed Income	11.8%	11.0%	10.5%	
Hourly				
Government Bonds	7.1%	7.7%	8.3%	
Diversified Portfolio	23.5%	(7.7)%	30.5%	
Fixed Income	11.8%	11.0%	10.5%	
GD Stock Closing Price	\$64.25	\$54.12	\$57.37	
() Denotes Negative N	umber			

General Dynamics flashback

Delta Dart was built for speed

Air Defense Command pilots who flew the Convair F-106 Delta Dart had a favorite saying about their aircraft: Convair built an airplane first; the pilot was an afterthought.

Although an exaggeration, it illustrates the regard that U.S. Air Force pilots had for their "hot" interceptor, the command's fastest aircraft. The F-106 looked like a rocket with a small cockpit at the front. A tall, husky pilot had little room to spare in his work space, but what the F-106 gave up in creature comfort it gained in performance.

The Delta Dart flew at twice the speed of

absolute world speed record, 1,525 mph. During its lifetime, the F-106 routinely flew 1,500-mph training missions in special supersonic corridors over sparsely settled areas of the country.

The Delta Dart replaced the F-102 Delta Dagger and was essentially a much-improved derivative of the F-102. Although similar in appearance to the F-102, the F-106 was aerodynamically cleaner. With a single Pratt & Whitney J75-P-17 engine, its performance far outclassed that of the Delta Dagger. With afterburner, the F-106 had 24,500 pounds of thrust at

The Air Defense Command wanted more than

F-106

Delta Dart

sound. The all-weather fighter protected the U.S. AIR FORCE FE:502 country's aerial boundaries for 29 years. It no longer is in the active Air Force inventory, having been retired last year. Sadly, the F-106's end will be an ignominious one. They are being converted to unmanned, remotely controlled target drones. They will become the prey rather than the 1,000 F-106s at As the hunter, the F-106 carried no guns but usually was armed with one nuclear-tipped Genie

and four air-to-air Falcon missiles in its weapons bay. The aircraft could climb to almost 52,000 feet in less than seven minutes after takeoff and could, with external fuel tanks, intercept an enemy aircraft up to 633 nautical miles away and return. However, the F-106 never saw combat.

Its lack of combat, however, is due only to the fact that the need for fighter interceptors in Southeast Asia was adequately met by the Convair-built F-102 Delta Daggers already present in the area as part of the USAF Pacific Air Forces.

The F-106's rocketlike fuselage was 70 feet 9 inches long and was supported by a triangular, or delta, wing with a wingspan of only 38 feet 4 inches. In the air, it resembled a thunderous dart. At a "hot" landing speed of 173 miles an hour, it required a drag chute to slow down quickly on the runway. It also was equipped with an emergency arresting tail hook.

The single-seat F-106A first flew on Dec. 26, 1956, at Edwards Air Force Base, Calif. First flight of the two-seat F-106B was on April 9, 1958, at the same base. Former astronaut Gordon Cooper was one of the Air Force's original F-106 test pilots.

The F-106 made international news on Dec. 15, 1959, when a test model gave the United States the

\$3.305 million each, of which \$1.5 million was for highly advanced electronics equipment. But defense cuts and the fact that the main danger States was considered to be to the United intercontinental ballistic missiles sharply curtailed production of the Delta Dart.

When production of the Delta Dart ended in January 1960, Convair had produced 277 F-106As and 63 F-106Bs. They served with 27 squadrons. The fleet remained mostly intact until Jan. 12, 1982, when the first Delta Dart went into storage at Davis-Monthan Air Force Base, Ariz. The number steadily increased as Air Force and Air National Guard F-106 units gradually switched to F-15 Eagles and F-16 Fighting Falcons. The last F-106 left the active inventory in 1988 when the 177th Fighter Interceptor Group of the New Jersey Air National Guard converted to F-16s.

The Air Force expects to convert nearly 200 Delta Darts to QF-106 pilotless aerial drones. As targets, the Delta Darts will fly in peril for the first time in their lives. ■ Ed Williams

Space Systems writer takes novel approach

66 T wish I could have slept even five minutes last night. Letters. Documents. Power of attorney, my will — all in order. Data cards? In the breast pocket of my flight suit. What have I forgotten? Nothing! Everything is in order—everything's 'cubed,' as space travelers say these days."

So begins the story of D.K. McKinzie's trip to Mars in the year 2037 chronicled in "The Emigrant Trail," a book just published by Space Systems. "D.K." is the character created by Mike Smith, marketing communications chief and author of the book. His narrative previews space travel 50 years in the future.

The main character, a senior writer for a science journal, has been selected and specially trained for the voyage to Mars. D.K. experiences each stage of the journey, including the first hop to the moon, a stay at a lunar colony and embarkation for Mars from a megaspaceport adrift between Earth and the moon.

The book contains many pieces of original art done by Smith and by Convair retiree Bob Kemp. Another retiree, Charlie Donovan, designed the layout. Graphic artist John Clinger, supported by Space Systems' graphic services department, prepared the 150-page book for printing.

Space Systems is distributing the book to educate the public about future space travel.

The book has generated many favorable comments. "It's been suggested by most qualified authorities that those who will ultimately take that voyage to Mars have already been born," said Smith. "What we hope to accomplish with 'The Emigrant Trail' is to get the word out to the public about the scope of the task still facing NASA and other space agencies around the world. Then, if it should come to a vote, they'll know what's at ■ Julie Andrews stake."



Bob Kemp, John Clinger and Mike Smith (from left) combined to publish the Space Systems book "The **Emigrant Trail.**"

Pomona's paint system is technological work of art

Dave Rubin sits at a console in the glass-enclosed control room at Pomona and monitors multicolored graphics on a video screen.

Beyond the window, racks of parts move methodically on an overhead conveyor, weaving their way through the adjoining rooms. The parts converge onto a track leading into a large chamber. Through the chamber's windows, Rubin watches the quick, precise movements of a large robot arm perform a choreography of pure efficiency.

Rubin is an industrial painter. He and his team are revolutionizing painting in the aerospace business with the industry's first automated robotic paint facility.

General Dynamics has always had a reputation for being on the cutting edge of technology. But, as Rubin points out, in the area of painting and finishing, the entire aerospace industry, including most of General Dynamics, has lagged in painting technology. It is still done manually, which is costly and time consuming.

"Nobody in the business has a facility like ours," Rubin said. "They're still painting multimillion dollar aircraft the same way they did in 1940."

In designing the system, Pomona's engineers looked to the automobile industry, the leader in industrial painting technology. "Our people went to Detroit, where they routinely paint millions of car parts. We adapted that technology to the requirements of our business," said Jack Brady, director of fabrication.

"And all of it is American technology," Brady added proudly.

At the heart of the system is a computer controller that monitors the entire painting operation, from masking through painting, drying, finishing and unloading. The computer, which has a data base of more than a thousand different parts, tracks each rack of parts through the entire process, adapting the process to the requirements of each part. An operator can alter any step of the operation at the touch of a button.

The workhorses of the system are two robot painters. In traditional manual painting, only about a quarter of the paint actually coats the parts. The rest is oversprayed into the air. Equipped with electrostatic paint guns, the robots deliver 75 percent of the paint on

Because all the painting occurs in environmentally controlled painting booths, those employees needed to operate the system are working in a cleaner, healthier environment.

unique computerized "paint on demand" mixing system. This continuously mixes only the amount of paint required, and can change colors of paint within 30 seconds. Combined with the electrostatic painting, Rubin calculates the system has reduced paint waste by 50 percent. "We used to discard gallons of excess paint, and at \$50 to \$60 a gallon, that adds up to big cost

The paint shop used to be a production bottleneck, but since the automated system came on-line in March, the time it takes to run parts through the painting process has been dramatically reduced. With its present capability, Pomona's system can cost-effectively meet all of the division's painting requirements. The system has the capacity to handle additional painting work from other General Dynamics divisions more competitively and at a higher quality.

"By attracting painting work from other divisions," Rubin said, "this system can move the corporation's painting technology into the 21st century."

■ Terry Snyder

Back for more

Electric Boat's design talent re-ups

Skilled drafters are not made in a day. Just ask Raymond Small, Fred Carlough, Arthur LeBeau or Gene Maynard of Electric Boat.

With 145 years of collective employment at the division and a combined 12 years of retirement, these men are finding themselves drawn back to Electric Boat by the challenge of *Seawolf*, the Navy's newest class of

"This is locally born and bred submarine design talent coming back to work on the major project of today, *Seawolf*," said Mike Margitan, chief engineerengineering design services.

Small of Groton was a drafter for 33 years and retired as a supervisor of electrical design in May 1984. "I always enjoyed the work," Small said. "But what adds

> an extra spark now is that it takes me longer to walk across the parking lot. I'm stopped by so many old friends."

The design skills that Small perfected are valued by Seawolf design workers. Small is teaching a six-week orientation series of drafting classes and is pleased that "some of the students are shipyard workers who want to change their careers, and I can help them realize their objectives."

Carlough of Waterford, Conn., worked at Electric Boat for 37 years, completing his career as design liaison. Those 37 years revved Carlough up rather than ran him down. "I'm an active person, involved in the local fire department and historical society, so I'm happy to assist my old

employer in getting through the labor crunch," he said.

Carlough likes the fact that he sets up his own work schedule, finding that "after 37 years, my work at EB is simply second nature."

Alfred A. Restivo, chief of electrical design and

coordinator of the division's Drafting Learner Program and the Design Apprentice School, emphasized that potential returning workers need not teach.

"With the shortage of skilled help around the country, the retirees can pass along their knowledge on a variety of projects, helping us in a pinch to check jobs that are on a tight schedule," he said.

Retirees usually work 20 hours a week planning their time to fit their schedules.

Maynard retired as manager in design services after 37 years at the division. He returned under contract to work for three months in Atlanta and for two in Tampa, where Electric Boat has engineering site offices. He coordinates division methodology and procedures with the design disciplines.

Why was he willing to interrupt his well-earned retirement? "It's pretty hard to walk away after some-body indicates there's a need, particularly after having spent so many years at EB," Maynard said.

Maynard and Small noted that returning workers are valuable because they are already knowledgeable in Electric Boat design methods peculiar to the submarine. "Experienced workers can marry the academic aspect of drafting to the real world," Small said.

LeBeau spent over 38 years at Electric Boat. He is taking time off from following the progress of his 10 children and managing his 14 acres in Canterbury, Conn., to return to the electrical design department, "working drawings and helping the younger fellows," he said

By passing along their skills, the retirees keep alive eastern Connecticut's tradition of submarine design.

Their expertise also produces the tangible results recognized by Margitan: "They have taken a bite out of our workload, helped us be more responsive to our schedules and have certainly helped the quality of our product."

Mary Budzik



Fred Carlough (left) and Arthur LeBeau are two of the retirees who have returned to Electric Boat.

attack submarine.

They are a few of the retired workers whose timehoned skills are speeding *Seawolf* detail design ahead as construction of the lead ship, awarded last January, begins in the Groton, Conn., shipyard.

Space Systems screening launch vehicle mock-ups

Like tailoring a new garment on a dummy, engineers at Space Systems used to design the highly complex routing paths of electrical wiring harnesses and pneumatic and hydraulic tubes for space launch vehicles by applying them directly to full-scale mock-ups of launch vehicle sections.

Solid modeling, a computer tool, is replacing this time-consuming manual process.

Now the mock-up resides in a computer data base. This allows harness and tube routing to be modeled at the computer screen, saving time and expense during design. The process also provides greater flexibility to adjust engineering changes.

"With solid modeling, we are able to produce an accurate computer model up front during the design process," said Steve Kewley, engineering support manager at Space Systems. "We are then able to check interferences as well as determine optimum routes for harnesses and tubes before we fabricate the parts."

Once the tube and harness route modeling is complete, the data is passed to manufacturing.

Data defines tube bend requirements in a format that works with the numerical control tube bender at Space

Systems' operation at Vandenberg Air Force Base, Calif. Before the data is sent to Vandenberg, engineers in San Diego review each tube to ensure production requirements have been met. A software program checks that the tube will not bend around and hit the numerical control tube bender during production.

The routing of flexible wire harnesses has provided the greatest challenge of computer-based mock-up stalled. Once the harness is routed through its optimum path, the computer model generates a flat pattern harness board layout. This layout is used to manufacture harnesses.

The technology fits well with Space Systems' engi-

neering methods in the corporate drive toward total quality management. It also contributes toward the overall division goal of lowering the cost of sending payloads into orbit.

"The list of computer-based mock-ups continues to grow," Kewley said. "It encompasses such things as payload adapters, fairings and the new interstage adapter for our Atlas II program. Computer performance limits the size of the mock-up that we can model. However, with the amazing increases we are seeing in computer performance, we expect to reach our goal of being able to model even the most complex mock-ups in the near future."

■ Julie Andrews



modeling. Routing rules needed to be developed to ensure the harness routing on the computer accurately represented how the real harness would bend when inOn the computer screen, Stan Turner checks one assembly of

the Titan/Centaur computer model shown in the upper right corner of the photo. Victor Valdez (top, left) and Michael Klein hold the actual assembly. July 1989 General Dynamics World



F-16B No. 2 sports green camouflage during a close-air support test flight earlier this year with company pilot Joe Bill Dryden in the front cockpit and marketing manager John Bean in the rear. An advanced forward-looking infrared sensor that turns with the pilot's head is visible on the forward fuselage, just in front of the canopy.

F-16B No. 2 is No. 1 in Fighting Falcon program

Just as the worldwide fleet of more than 2,000 Fighting Falcons has performed yeoman's service for 15 air forces over the last decade, a single aircraft at Fort Worth has been a workhorse for General Dynamics.

F-16B No. 2 has functioned in numerous company and government-funded test programs that proved new capabilities for the F-16. At the same time, the plane has given dozens of demonstration flights that eventually led to new sales.

It has been a valuable tool for customer, community and public relations while performing F-16 orientation flights conducted for VIP and high-profile media visitors to the Fort Worth Division. Company test pilots have also put it through its high-performance paces to thrill thousands of spectators at local air shows.

As of mid-June, the two-seat B No. 2 had logged 1,684 flying hours in more than 1,350 flights in its 11 years of service.

F-16B No. 2 has had many names since it was first delivered as an F-16 full-scale development test aircraft in 1978. Following nearly 350 flights in that program at Fort Worth and Edwards Air Force Base, Calif., it was modified at Fort Worth and became the F-16/79 intermediate or "export" fighter under the Carter administration's export fighter policy.

Aircraft B No. 2 began flying as the F-16/79 in October 1980. The F-16/79, equipped with a less powerful, 1960s-era J79 jet engine, was offered to a number of nations that were excluded from standard F-16 sales under U.S. foreign policy at that time.

Representatives of many nations made evaluation flights that eventually led to F-16A sales to Pakistan, Venezuela, Singapore, Thailand and Indonesia after the export fighter policy was relaxed by the Reagan administration.

The U.S. Navy also considered the F-16/79 as its new adversary fighter to simulate Soviet aircraft and tactics. Navy evaluators were impressed with the aircraft and

used it to launch a study in which they eventually chose a modified version of the F-16C, the F-16N, as the new adversary fighter. Fort Worth delivered 26 F-16Ns.

In the final months of its career as the F-16/79, the aircraft flew with reconnaissance pods to test sensors and data links that transmit information almost instantaneously.

After 648 flights as the F-16/79, it was returned to the modification hangar at Fort Worth in 1986. It was reconfigured as an F-16B with a few selected F-16C avionics systems added. Equipped with a standard F100 engine, it began flying as Fort Worth's designated technology demonstrator in October 1986 and was fitted with an upgraded Pratt & Whitney F100-PW-220 powerplant in early 1987.

Since then it has made nearly 400 flights in demonstrations and tests of advanced systems for night attack and close air support of ground forces.

Future tests with the aircraft are expected to focus on advanced capabilities related to Maverick air-toground missiles.

F-16B No. 2 fills a critical Fort Worth testing niche as the only aircraft the company has under long-term lease from the Air Force. "We have it written in our lease that we can modify the airplane as needed as long as it's safe," said Earl E. Guthrie of flight test, who manages the aircraft's configuration and schedule.

"The airplane has made an invaluable contribution to the development of emerging technologies for F-16 applications," said Neil Anderson, director of market development and flight demonstrations. "Having a test airplane here in Fort Worth, instead of having to coordinate and go to Edwards Air Force Base for every flight, has been a tremendous advantage and timesaver."

Solid support keeps B No. 2 in the air

The value and success of F-16B No. 2 can be attributed directly to the outstanding efforts of Fort Worth employees who support it.

"I am always impressed with how the airplane keeps on working," said Fort Worth test pilot Joe Bill Dryden, a frequent flier of B No. 2. "The airplane is really the first two-seat, all-up avionics F-16 in history, and it has many parts that no longer exist in any other F-16 flying.

"Besides the countless modifications that have been accomplished, it also has bits and pieces of just about every model of the F-16B and D that has ever existed. It is a real tribute to the crew chief and his specialists that the airplane flies and flies and flies."

Added test pilot Jon Beesley, who also flies the aircraft often: "The maintenance team and many other people, from flight test engineers on down, deserve the credit. The entire team has shown a tremendous amount of dedication, determination and skill, while working under a great deal of pressure, in quickly doing things that have never been done with an F-16 before."

Dryden mentioned a particularly enjoyable aspect of the technology demonstrations. "Jon and I have had many interesting experiences of seeing skeptical visitors, at the end of the flight, walk away, mumbling to themselves, 'By gosh, this stuff really does work!"

■ Joe Stout

Engineer acts out Hollywood fantasy in submarine movie

Space Systems engineer Fred Ramirez is not signing autographs even though his coworkers have affixed a big star on his chair.

Ramirez recently spent 10 days in Hollywood where he had a bit part as a Soviet submarine crew member in the filming of the Tom Clancy novel "The Hunt for Red October."

The five years he spent on submarines—including 3½ on the Electric Boat-built USS *Portsmouth*—gave him an edge over 500 people who auditioned in San

Diego in February.

Ramirez played the Soviet quartermaster of the watch in the battle station scenes. He coached other actors, including the star, Sean Connery, who plays the Soviet submarine captain, on the technical accuracy of submarine commands. Ramirez had no lines in the movie.

Moviemaking means 12-hour days and much standing around, according to Ramirez. But he would do it again in a moment. "I've always wanted to be in show

business," he said. "Maybe when they film the sequel, 'Red Storm Rising,' they'll call me again." Meanwhile, "October" will be released at Christmas.

Ramirez's souvenir from the movie is a well-thumbed copy of the novel carrying the autographs of stars and crew. One of the inscriptions is from actor Michael Weldon, who played the Soviet navigator: "Thanks for all your help. The navigator would have been lost without you."



Sometimes what it takes to put a life back together is a hammer and nails. In Lima, Ohio, a woman drives home a nail. And

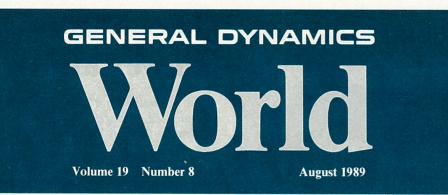
drives home a new skill. Another tears down an old wall. And tears down old defeatism.

These women are rehabilitating a neighborhood. And at the same time, they are rehabilitating themselves. They are inmates at the nearby Marysville prison who are contributing to a neighborhood revitalization project funded, in part, by General Dynamics.

They learn to replace drywall, fixtures, cabinetry, stairways, porches, siding, roofing, and more.

For the community, the result is very high quality, affordable family housing. For prisoners turned productive, the result is new confidence, new job skills, and a new chance at life. **GENERAL DYNAMICS**

A Strong Company For A Strong Country





Citation V 'sells like Batman tickets'

"We asked owners to describe the ideal business jet. Then we built it."

With those words Cessna began a publicity campaign for its new Citation V last year. The results have surpassed the company's fondest dreams.

"Anytime you design a product, you try to match its features to the wishes of the marketplace," said Roy H. Norris, vice president-Citation marketing. "The actual characteristics don't always match, but once in a while you do match up like this and that has led to the Citation V's unprecedented success."

From its increased cruise speed to its roomy cabin to its range and ability to operate out of small airports, the Citation V has captured the imagination of the

air/business community. As one corporate official pronounced, "They're selling like Batman tickets."

The first Citation V, a larger, faster and higher-performing derivative of the company's successful Citation II and S/II business jets, was delivered in April following Federal Aviation Administration certification in December. Orders have been coming in rapidly ever since.

More than 90 aircraft have been ordered by customers in 13 countries. The backlog extends through November 1990. Cessna, in fact, has increased production from less than four Citation Vs a month to almost five.

(Continued on Page 6)

Picture this: an employee photo contest

Imagine a photo you've taken gracing desks and office walls throughout General Dynamics. Better yet, imagine a \$100 or \$200 savings bond in your safe deposit box.

Such prizes and publicity await the best of General Dynamics' thousands of aspiring amateur photographers, thanks to a companywide contest starting now.

All employees, except General Dynamics' professional photographers, may enter the contest by submitting an 8x10 print of any subject: animals, people, architecture, still life... you name it. As many as 48 winners will receive savings bonds and their photos will illustrate a 1990 company calendar.

Contest judges named...Page 3

Photos may be black and white or color, glossy or matte finish. Photo negatives must be available on request and no special darkroom effects are allowed. Send the print with your name,

employee number, division and day/night phone numbers to Contest, Public Affairs Office, General Dynamics Corp., Pierre Laclede Center, St. Louis, MO 63105. Include a self-addressed 8x10 envelope if you want your print returned. Call (314) 889-8564 or 8566 for more details.

The contest deadline is Nov. 1. Any photo taken since June 1988 is eligible.

Twelve first-prize winners each receive a \$200 savings bond. Their photos will be featured on the top half of each calendar page. Up to 36 honorable mentions will receive a \$100 savings bond. Their photos will also highlight the calendar.

The calendar will be distributed as individual pages in consecutive issues of *General Dynamics World*. The December issue will contain a center page insert with January's calendar on one side and February's on the reverse. Each *General Dynamics World* through May will contain two months of the calendar.

So, shutters, on your mark. Ready...set...click!

News Briefs

Earnings, backlog up despite \$50 million charge on SSN 688s

Company earnings are up and backlog has reached an all-time high.

Those are the highlights of General Dynamics' second-quarter earnings report. Earnings for the quarter stood at \$58.4 million, or \$1.39 per share, on sales of \$2.5 billion; figures for the second quarter of 1988 were \$46.7 million, or \$1.11 per share, on sales of \$2.4 billion.

The company attained these figures in the second quarter of 1989 despite an after-tax charge of \$50 million, or \$1.20 per share, on the SSN 688-class attack submarine program at Electric Boat Division.

Funded backlog reached \$17.9 billion and total backlog stood at \$28.8 billion, both record figures for the company. For the first half of 1989, earnings were \$133.8 million, or \$3.20 per share, on sales of \$4.9 billion, all increases over the first half of 1988.

YWCA honors four women

Four General Dynamics employees recently received the San Diego YWCA's Tribute to Women and Industry Award. The honor goes to women who have contributed significantly beyond the normal scope of their jobs in managerial, executive or professional roles.

Company employees who received the award are Jan M. Eldridge, Convair purchasing agent; Barbara J. Woolley, Electronics manager-salaried personnel administration; Vicky Lee Abbott, Data Systems chief-business system development; and Janet J. Goforth, Space Systems manager-compensation and college relations.

Scheideman joins Corporate

D. Blaine Scheideman has been appointed corporate vice president-contracts, pricing and international offset. He succeeds Fred Wood, 6l, who

Scheideman, 58, has been division vice president-contracts and estimating at Fort Worth since 1980. Previous to that, he was vice president-F-16 deputy program director of plans, contracts and controls. He joined General Dynamics at Fort Worth in 1966.

Electric Boat trio cashes in

Three longtime Electric Boat employees invested \$3 in Lotto America tickets and reaped a \$39.86 million dividend. Sheila Phillips, George Brown and George Mages pooled their cash and bought three Lotto America tickets in Warwick, R.I., on July 15. One ticket turned out to be the winner. The three will each receive \$664,333 annually for the next 20 years.

RAM production contract in

Valley Systems has received a letter contract for the initial production of 500 Rolling Airframe Missiles from the U.S. Naval Sea Systems Command. The contract is for a not-to-exceed amount of \$85.6 million.

Long-lead authorization has allowed some production activities to begin before the contract award. Deliveries will start in 1991 and continue through 1992.

The missile is a lightweight, quick-reaction, high-firepower weapon system designed to defend against anti-ship missiles.



HELPING TO ACHIEVE. Lil V. Ciric (right), a marine engineer at Electric Boat, instructs a class at Fitch Junior High School in Groton, Conn., while their teacher, Robert Allin, watches. Ciric and fellow Electric Boat employees Frank B. Barravechia, a senior buyer, and David Sullivan, a senior program coordinator, taught basic economic and business principles at local schools as part of Junior Achievement's Project Business. Susan M. Strader, a senior inventory planner, is Electric Boat's chairperson for Junior Achievement.



The eroding environment

"When it comes to their environment, Americans are spoiled brats. They complain angrily about pollution, but would resist to the death any sacrifice that meant changing their own lifestyles."

Those are comments from one St. Louis radio talk-show host following appeals at the recent Paris seven-nation summit for "decisive action... to achieve a healthy and balanced global environment."

Is it true? Does the average citizen — and do business and industry — only pay lip service to actions for a better environment?

Tough questions. Certainly there are the increasingly common horror stories of individuals or big companies flouting or circumventing conservation and anti-pollution laws. On the other hand, many private citizens and businesses regularly go beyond basic legal requirements to protect our air, land and water. Predictably, however, it's the horror stories that get the headlines.

General Dynamics is only one of many U.S. companies that have had the environment on the board room action agenda for some time. The elimination of 40 million pounds of hazardous waste in just four years has made GD's environmental management program something of a benchmark in the industry. Pomona Division's aggressiveness in reducing wastes by 96% and ridding itself of PCB transformers and single-walled storage tanks has won it national recognition.

In San Diego, meanwhile, Electronics Division has totally done away with volatile organic compounds in its painting operations—and other divisions around the country have made similar inroads.

But admittedly, there is much to be done and there are those who even believe the escalating front-page attention to the environment may be a clarion call too late.

Business can expect tighter and tighter reins. California in particular, with America's worst air pollution, is a beehive of burgeoning restrictions. The city

of Irvine voted last month to impose probably the toughest local regulations yet to control ozone layer-damaging chemicals. Some 5,000 businesses, more than a few aerospace-related, now have less than 12 months to do away with the use of most chlorofluorocarbons that erode the ozone layer.

Perversely, the radiation-filtering ozone in the upper atmosphere becomes hostile smog at lower altitudes: the product of volatile organic compounds and nitrogen oxides emanating from vehicles, boilers, manufacturing and hundreds of other manmade sources.

A report on urban smog was issued last month by the Office of Technology Assessment, based on the Environmental Protection Agency standard that an average one-hour ozone atmospheric concentration of more than .12 parts-per-million is proven to be harmful. The newest data indicates that areas housing more than half of America's population exceed this standard (including areas where all of GD's major operations, excepting Cessna, are located). In southern California, Houston, Chicago and the Washington-to-Boston corridor, the ozone concentration is as much as three times the acceptable peak.

As environmental restrictions increase — and they are certain to — it's clear that everyone will have to do more than just sing in the chorus. Individually, we can all reduce pollutants by such "DOs" as carpooling, energy conservation, recycling and using water-based paints and solvents; "DON'Ts" include topping off your gas tank (spillage evaporates), using aerosol sprays, and being a "backyard burner."

As GD employees, we can rally behind the efforts of our divisional environmental resource management teams — alerting them to areas of concern and looking for ways to reduce air pollutants and sources of hazardous waste.

But the worst thing we can do is not to take it seriously.

..PKC

Precautions assure survey anonymity

(This is another in a series of columns by Survey of Employees Manager Naomi M. Morales that will appear in General Dynamics World before this fall's survey.)

Over the last few months, I have asked employees at many locations how we can improve the survey process. Many people suggested assured anonymity for survey participants. This article explains a few of the measures that will protect an individual's identity.

Great precautions are built into the system by the consulting firm of Sirota, Alper and Pfau. All questionnaires are mailed by your survey manager directly

to the data processing firm. Once the firm puts the responses into the data base, the questionnaires are secured at their office for six months, then destroyed. None is returned to General Dynamics or reviewed by General Dynamics employees.



Employees will be asked to report a few demographics, such as how long they have worked for General Dynamics. The information is important to determine division and corporate strategies and policies. However, demographic information will be summarized only at corporate or division levels. For example, your supervisor will NOT receive information for the "new" and the "longer service" employees in their work group.

Only managers with 10 or more employees who have taken the survey will receive a report summarizing the results for their group. If there are less than 10, the responses become part of the next-higher report. For example, surveys received from such a small group will become part of the total report of the supervisor's boss, or the next larger unit.

As in the 1986 survey, several questions will ask employees' opinions on various subjects. Employees are encouraged to fill out this area since the information helps management clarify and resolve problems. The responses are sent to the consulting firm, which summarizes the suggestions and deletes any identifying names or phrases.

For further information or clarification, call your division survey manager, or me at the Corporate Office.

Company forms unit for pilotless vehicles

General Dynamics has formed a business unit that will deal with the new technology of unmanned aerial vehicles. The pilotless vehicles will be designed for a variety of attack and reconnaissance missions.

Dr. Miles Libbey, corporate director-unmanned aerial vehicles, heads the unit and reports to Chuck Vollmer, staff vice president-Defense Initiatives Office. During its start-up, the Unmanned Aerial Vehicle Unit will be co-located in the Defense Initiatives Office in Rosslyn, Va.

The unit's first major program is a teaming arrangement involving Israeli Aircraft Industries' Harpy system. Harpy is a ground-launched, propeller-driven drone that destroys military targets.

UAV STAFFING: About 26 people will staff the Unmanned Aerial Vehicle Unit, with many of them recruited internally. Career opportunities exist for program managers, engineers and finance and administrative professionals from other General Dynamics' divisions, primarily aerospace. A recruiting team will visit the divisions and interview job candidates. Interested employees should contact their human resources departments for a list of positions and qualifications.

Correction

In our front-page story of the April 1989 General Dynamics World, it was erroneously stated that the United Auto Workers supported the Egyptian tank coproduction project. We regret the error.

... Editor

Wood's work over for now

Fred Wood retired Aug. 1 as General Dynamics' executive vice president of contracts, pricing and international offset to pursue a life of golf and travel. At least, that's what he wants people to believe.

But ask him about his retirement plans. Wood insists his 65-hour weeks are over, but his planned "new level of service" continues his commitment to peers, friends and the community.

"I want to devote my energies, frankly, to local kinds of things...I have agreed to continue [with General Dynamics] as a consultant for a period of time at a reduced scale," Wood said. "Sure, I will pick up other things that capture my imagination, but I don't want the 65-hour week."

Wood's long hours during his 11 years at General Dynamics have left noticeable results. He is most proud that he has established a vice president of contracts and estimating at each division. Previously, the director level was the last rung on the contracts and estimating career ladder. All of the new vice presidents have come from within the company and many have worked with Wood in St. Louis.

"Now we have, in my judgment, outstanding, bright, young, highly trained people that will stand the company in good stead for many years to come," Wood said. "I'll miss the people at General Dynamics. There are very, very fine people here. And I'm not just talking about the people in St. Louis."

Wood's concern for others and the value of communication are keys to his effective interpersonal skills. Learning to communicate was an important part of his upbringing and something he has stressed within his own family. "We went so far as to define communication because it really is 'transmit,' 'receive' and 'understanding' in the middle," Wood said. "Many people are busy transmitting, many people are busy receiving but few people are busy communicating.

"I grew up in a household where communication was valued and I carried that into my adult life...I don't care how smart you are, if you can't articulate that in some form to someone, you're in trouble."

The Woods plan to stay in St. Louis

for several reasons.

"We like where we live and we don't want to move where we don't have friends," he said. "St. Louis has been very warm to us, so why not stay?"

St. Louis is also a central location for Wood's children who live in cities from New York to Texas. Wood is proud of his children's achievements.

"They probably motivated me," Wood said. "We had the typical struggles of raising a large family, or any family for that matter. But the kids were never really that painful. We liked each other and raising them was no big deal. They are pretty neat folks."

Wood credits his wife Erma for providing a solid family foundation while he traveled extensively

> "I want to devote my energies to local kinds of things."

during his career. When asked what award he would present her, he quickly answered with a robust "Me!" But his praise continued. "Clearly, she's very important to our family. The fact that the kids are reasonably happy and normal, I attribute to her. She deserves everything she wants."

His decision to retire focused on his wish to enjoy time with his family while he is young and healthy. "People say, 'Gee, why do you want to retire at such a young age,' and I say, 'Why not?' The kids have all gone to the school of their choice, they're on their

own and we have five cents more than we need, not want. There's an opportunity now to provide another level of service in the next phase of our lives."

He will continue serving the community on the boards of the University of Dayton, and Barnes Hospital and the Municipal Theater Association in St. Louis. He is also on Barnes' executive committee and the chairman of the personnel and compensation committee.

The Woods plan to travel to cities that he has previously seen only from airports and conference rooms. "I like the fact that we'll have no predetermined destination," he said. "I don't want to be overscheduled or waiting for the telephone to ring." Possible destinations for this fall are Athens, Vienna and Munich.

As for his goals, Wood is adamant. "I want to get my golf handicap back to a single digit. It was years ago, and I want to get it there again."

■ Katherine Kelly

Division photographers to help pick winners

The difficult task of judging winners in the upcoming employee photo contest will be assigned to a sevenmember panel from General Dynamics' communications and photo departments.

The panel will include three division photographers who have been recognized for exceptional work: Valley Systems' Mitch Mitchell, Land Systems' Milt St. Onge and Convair's Tim Whitehouse.

Mitchell's photos have graced numerous company publications. His imaginative and colorful shots of Valley Systems employees at work have been published widely by newspapers and magazines.

St. Onge recently finished second for best in-plant photography in a competition sponsored by the Pro-

fessional Photographers of America. St. Onge was honored for his photo of laser beams passing through optics crystals in tests of an electro-optics system for the M1A1 Abrams tank.

Whitehouse took the cover photo of the company's award-winning 1988 annual report. Like Mitchell and St. Onge, Whitehouse has also provided numerous photos for company publications and media releases.

The remaining judges for the photo contest are Bob Morris, corporate vice president-communications; Peter Connolly, corporate director-public affairs; Tom Rule, corporate graphics project administrator; and Dave Lange, corporate manager-internal communications.

Ewing, Dickinson bear TQM tidings

Applying the total quality management philosophy of customer service, process benchmarking and continuous process improvement to material management can help General Dynamics improve its position as a world-class competitor in the defense industry.

During recent visits to all of the company's major locations, that was the message brought by B. Edward Ewing, corporate vice president-operations, and Monty W. Dickinson, staff vice president-material, to over 2,000 people who perform the actual job of buying, planning and expediting. The visits consisted of presentations followed by question-and-answer sessions.

"General Dynamics must be competitive in the world economy because Japan and other countries are focusing on specific competitive philosophies and practices that aim at beating tomorrow's competition," Ewing said. "It means benchmarking ourselves against the world's best to accomplish this objective."

Ewing cited Ford Motor Co., which benchmarked its material management acquisition process against Toyota and adopted many of its procedures. "The result is Ford has become a U.S. leader in automotive design, manufacturing and profitability," he said.

According to Ewing, initiatives that General Dynamics must adopt to compete in the global economy include:

- Developing long-term partnerships with fewer selected suppliers to improve internal efficiencies and reduce unit costs;
- Utilizing more competitive single sources for certain materials and services;
- Designing components with fewer parts to reduce the overall cost of material;
- Reducing inventory and number of warehouses to better utilize facility square footage;
- Reducing the total process flow time from receipt of material to the delivery of the final product;
- Reducing material management costs.

TQM drive begins

Fort Worth recently took its first major step toward total quality management with a three-day seminar attended by Vice President and General Manager Charles A. Anderson and all vice presidents and department heads who report to him.

Representatives of the division's primary customers, the U.S. Air Force and Navy, were also present.

Attendees heard and discussed the results of total quality-related surveys, interviews and focus groups conducted at Fort Worth over the last few months. The sessions were led by representatives of the Cumberland Group, a firm that is assisting the division.

"We received the input of employees who participated in the earlier activities, along with other pertinent data," Anderson said. "We then planned our strategy, set immediate priorities and began to take action."

The seminar was held to define total quality management better as it relates to jobs and processes at Fort Worth. It also committed management to a long-range, divisionwide program that is based on employee input and data, according to Willie Livingston, Fort Worth's TQM director.

The meeting participants defined Fort Worth's "vision": industry leadership "in supplying world-class, high-technology aircraft and related systems for maintenance of world peace." It will be achieved through "a caring partnership of employees, community, suppliers and customers."

GENERAL DYNAMICS

World

Published by: General Dynamics Corporation Pierre Laclede Center, St. Louis, Mo. 63105

Manager of Internal Communications: Dave Lange

Contributors: Julie Andrews, Graham Gavert, Don Gilleland, Myron Holtzman, Dean Humphrey, Jack Isabel, Jerry Littman, George Livesay, Bruce McIntosh, Jack Price, Tom Rule, George Salamon, Chris Schildz, Peter Stamos, Joe Stout, Joe Thornton, Ed Williams

Hundred-hour weeks are worth it, say Sloan grads

WANTED: Promising midlevel executives to interrupt careers and relocate for 10 months to Palo Alto, Calif., or for 12 months to Cambridge, Mass. Candidates must be highly motivated and prepared to put in 80-plus hours per week to complete individual and group assignments. Some travel required. Candidates must have the full endorsement of top management at their sponsoring organizations. Persons successfully completing this program will receive master of science in management degrees from one of the nation's top business schools.

Who could reply to such an ad? Only a select and talented group of individuals if the advertiser is the Alfred P. Sloan Fellows Program.

And reply is exactly what two Data Systems employees did in the fall of 1987. At that time, Mary Jo Morris was manager-quality assurance at Data Systems-Western Center in San Diego and Norm Thurow was manager-data administration at Data Systems-Central Center in Fort Worth.

The Sloan program trains young, experienced business people who have potential to rise quickly from narrow, specialized fields to executive levels of general management. Its objective is to provide students with greater knowledge and understanding of the firm's management and total environment. It is also one of the tougher executive education programs to enter. General Dynamics awards Sloan fellowships to only two carefully screened employees each year. One employee attends the Massachusetts Institute of Technology and the other Stanford University, the only schools where the Sloan program is offered.

"The Sloan program is especially demanding and rigorous, but very rewarding," said Thurow, who completed his Sloan fellowship this spring.

Thurow, newly appointed director of information systems development at Data Systems headquarters in St. Louis, is the first General Dynamics employee to complete a Sloan fellowship at Stanford. Morris, newly named program manager for tactical systems and transferred to Electronics in San Diego, graduated this spring from the Sloan program at MIT.

Morris and Thurow took advanced courses in human resources, strategy, management decisionmaking and economics. They often worked with groups of other Sloan students to complete

Morris also wrote a 120-page thesis titled "Multinational Teaming in the Defense Industry." Her class traveled to the Soviet Union, Hungary and West Germany for three weeks to study those countries' economies. Both classes visited Washington, D.C., and New York to meet top executives in American business and government.

"I've lived all my life in San Diego and worked only at General Dynamics, so the Sloan program made me realize there was a world outside of that," Morris said.

Two other General Dynamics employees, John P. Casey of Electric Boat and Richard W. Jennings of Data Systems-Western Center, begin the Sloan program this summer. Casey is SSN 751 ship manager of post-launch and Jennings is chief of computer-aided design/computer-aided manufacture. They will find the program requirements demanding. Two years of study are condensed into one and 80 to 100 hours per week of classes and preparation are not unusual.

Thurow and Morris agree the program is well worth the investment of time. "You learn how to work in groups, and that's critical to success in top management," Thurow said. Summed up Morris, "You heighten your awareness of what corporate America and the global marketplace are all about. You learn to think more broadly and to keep a global, long-term perspective in mind. These are important tools for making sound business decisions." **■** Dave Lange



Renuka Viswanathan has helped rearrange machinery for maximum efficiency and cost savings.

Pomona intern has '200 grand' ideas

HEN DIRECTOR of facilities Al Doriguzzi hired Renuka Viswanathan as a student intern at Pomona Division, he got a lot more than he bargained for —\$200,000 more. That's how much the recent graduate of California State Polytechnic Institute has saved the division with her ideas and hard work during her four internships at Pomona.

Viswanathan first showed interest in the machine shop. Doriguzzi encouraged her to work with the plant production staff, one of his department's many internal customers.

"When we turned her loose on the factory floor, we unleashed a dynamo," Doriguzzi said.

Working with supervisors and assemblers to determine product flow, design machinery placement, prepare proposals and supervise rearrangement, she designed efficient shop operations.

During a recent major rearrangement in the metal fabrication area, Viswanathan installed two new surface grinders and rearranged existing machinery with minimum interruption to the flow of critical production and delivery schedules. She consulted with the workers who would be using the equipment, and then developed a layout. Time became a constraint since estimates allowed a minimum of two weeks to install the new equipment and move other machinery to fit the newly designed product flow.

"I couldn't see having this vital area out of commission for that long," she said. "So I got together with the vendor and shop supervisors and we agreed to do it a little differently.

The vendor and shop personnel agreed to install the

machines and move other equipment over a weekend. The area was back on line within four days with an estimated savings of nearly \$100,000.

She was commended in 1988 for savings of more than \$112,000, which helped the division top its cost reduction/profit improvement goal by 76 percent.

"Renuka's record of cost savings would be a strong accomplishment by any of my staff," Doriguzzi said. "But from a student intern, it is extraordinary."

Jack Brady, Pomona's director of fabrication, also praises Viswanathan. "She is dedicated and motivated to make our work areas more productive," he said. "She is on the production floor as much as any of my own people, studying work flow and looking for ways to do things better. We all appreciate her efforts."

Viswanathan graduated with a bachelor of science degree in industrial engineering. She says her work at General Dynamics has given her the opportunity to develop and apply her skills to real-world situations.

Viswanathan is quick to credit the team spirit in the facilities and production departments for her successes.

"I have been extremely fortunate to work with people who see possibilities where others might see only problems," Viswanathan said. "I have had real freedom here to work on responsible projects that utilize my formal training and allow me to make a viable contribution to the future of this division."

Doriguzzi has offered her a full-time position in his department. "She has the right education and attitude," he said. "And, she has four years' experience on the job. I look forward to her continued good work with us."

■ Eric Solander

Company-sponsored class helps save life

Denise Wilson, an employee at General Dynamics' Nothing happened. Defense Initiatives Office in Washington, recently participated in a company-sponsored refresher course on cardiopulmonary resuscitation.

a document control specialist in the security department. Participants took turns practicing on a mannequin and learned the Heimlich maneuver, a method used to dislodge food from the windpipe of a choking

the refresher course said something that stuck in Wilson's mind. "He told us that if you ever have to perform some part of CPR, it's usually on a family member," she said.

Within just 48 hours, the instructor's prediction came true. The lessons taught in that class helped save the life of Wilson's 1-year-old daughter, Jade.

When a piece of food lodged in Jade's throat, her mother quickly gave her four solid back blows.

"I was scared to death," Wilson said. "Jade began to turn red."

Wilson said that after the back blows failed, "it just It was a routine five-hour session, recalled Wilson, came to me — do the Heimlich thing. I made a fist with one hand and held her back with the other hand. Gently, but somehow forcefully, I did it." The blockage was removed and Jade's life was saved.

It was an emotional moment for Jade, Denise and Denise's 5-year-old son, Stephen, who first alerted The Arlington County (Va.) fireman who directed his mother that his sister was choking. "We all cried tears of joy," Wilson said.

Wilson said she is thankful that General Dynamics offered the refresher course and that she had the good sense to participate.

"Every chance I get, I tell people to take a refresher class on CPR," Wilson said. "What better proof do you need than to look at what happened to me?"

■ Joe Sutherland

Children's network called Ethics Hotline for assistance

General Dynamics' Ethics Hotline inspired a caring San Antonio citizen to create a children's hotline that has helped hundreds nationwide overcome the serious problems of growing up.

Jerry Sills, ethics program director at Fort Worth, helped Tony Overman, a former national coordinator with the American Institute for Character Education, design the "I Care Hotline." It is the first and only national hotline that youngsters may call toll-free anytime.

General Dynamics was "the spark that got the fire going," Overman said. Two years ago, while midflight from San Antonio to Washington, D.C., Overman read an article about the GD Ethics Hotline and its success. Impressed, he called Sills immediately after the plane landed to arrange an interview. Sills offered Overman advice about the hotline and donated sample materials. More importantly, Sills provided the moral support that Overman needed to start the non-profit program in September 1988.

Overman researched whether or not youngsters would respond as readily as GD employees had to the hotline. He found that kids would use a hotline if they had its phone number handy. The "I Care" program gives children hotline materials to carry with them so that the number is always available.

Youngsters in kindergarten through grade 12 can use the hotline, which serves as a network for further help. When a child calls anonymously, the operator refers him or her to a national hotline that deals specifically with drug and alcohol abuse, sexual and physical abuse, pregnancy, suicide, AIDS information or other support programs. The "I Care" number is (800) 992-1722.

The second goal of the "I Care Hotline" is to encourage callers to leave their names. The operator can then ask the child's school counselor to offer personal guidance.

Overman and his staff attend conventions and give speeches nationwide to introduce school districts to the hotline. Twenty-one districts participate and 50-75 are expected to join this fall. In each school, students learn about the hotline at a rally where Overman distributes posters, bumper stickers, carrying cards and book covers. Future rallies will include a 20-minute video on self-esteem and how to combat drugs in school.

In its first six months, the "I Care Hotline" helped 737 students. According to one grateful school administrator, Overman and his program have been "a lifeline for many troubled students."

Overman, in turn, praises General Dynamics: "I talk about General Dynamics a lot because I want (the company) to be given credit. Your ethics hotline generated the idea and was a key part of the program."

■ Katherine Kelly

Fort Worth resurrects F-16 headed for scrap

Some of the people at Edwards Air Force Base, Calif., expected to write off F-16C No. 4J1 as a loss after it was damaged in an extremely hard landing by an Air Force Flight Test Center pilot in late 1987.

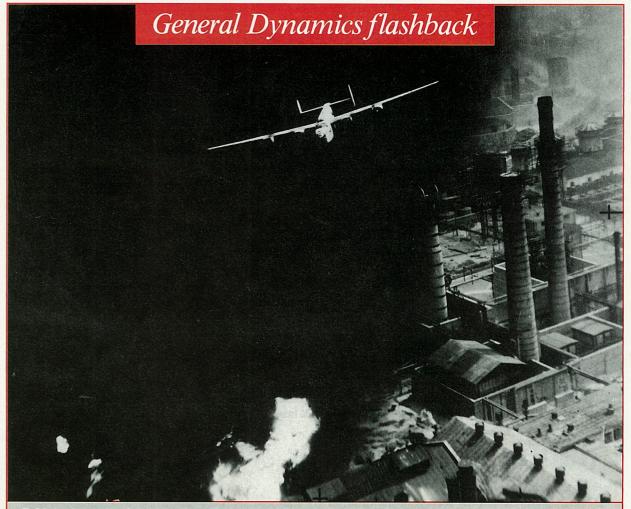
But after a 10-month restoration by Fort Worth's modification and test group, the Fighting Falcon is back at Edwards and is again serving as a flight test vehicle for the Israeli air force's F-16C program.

A Fort Worth team visited Edwards shortly after the landing accident and decided the airplane could be repaired. It was transported to Texas in March 1988. Work began about two months later.

Major portions of the inlet, lower fuselage bulkheads, aft fuselage and aircraft skins were either repaired or replaced. Many wiring harnesses were also replaced.

At least six people worked on the airplane full-time, and the crew grew to as many as 12 people when they replaced or updated flight test instrumentation. The aircraft was completed and returned to Edwards earlier this summer.

Aircraft 4J1 is the first damaged F-16 that Fort Worth has restored, although the division has put 13 damaged F-111s back into service.



B-24s bombed oil refineries at Ploesti, Romania, at incredibly low levels, barely clearing smokestacks.

B-24s missed only one target: publicity

This year marks the 50th anniversary of the first flight of the B-24 Liberator, which was designed and built by one of General Dynamics' predecessors, Consolidated Aircraft Corp. Ceremonies marking the B-24's first flight will be held in San Diego, the aircraft's birthplace, Sept. 20-24. A grant from General Dynamics has helped the Collings Foundation restore a B-24 to flying condition.

0 0 0

It certainly was not a glamorous racehorse, but the Consolidated B-24 Liberator was a workhorse with the qualities of a thoroughbred.

The B-17 Flying Fortress got most of the heavy bomber publicity early in World War II. But the B-24 could carry more bombs faster and farther than the B-17. At a speed of more than 200 mph and an altitude of 28,000 feet, the Liberator could carry 8,800 pounds of bombs up to 3,000 miles.

More than 18,000 Liberators in a number of versions were flown by every branch of the U.S. armed forces and by many foreign nations. The Liberators proved themselves in every theater of war in a wide variety of missions. The B-24 deserves its reputation as one of the great aircraft of World War II.

The B-24's history began in January 1939 when Army Air Corps Maj. Gen. Henry "Hap" Arnold asked Consolidated Aircraft Corp., one of the companies that later merged to form General Dynamics, to design a strategic bomber that could

"fly the skin off any rivals." Within a year, the San Diego-built XB-24 made its maiden flight and the Liberator went on to become the most produced American military aircraft of all time.

By the end of the war, Consolidated-Vultee (Convair) workers had turned out 9,760 Liberators in many versions. Of these, 6,726 were built in San Diego and 3,034 were built in Fort Worth.

Liberators produced by other companies brought the total to 18,479. General Dynam-genera

ics' Fort Worth Division, which now produces the F-16 Fighting Falcon, owes its birth to the insatiable wartime demand for the bomber.

From the onset, demand reached such proportions that Consolidated needed additional production space. Ground was broken for a government-built B-24 plant at Fort Worth in April 1941. The first Fort Worth-built B-24 was accepted by the U.S. Army Air Forces 100 days ahead of schedule in May 1942.

The B-24 was so successful a design that five factories — Consolidated at San Diego and Fort Worth,

North American Aircraft Co. at Dallas, Douglas Aircraft Co. at Tulsa, Okla., and Ford Motor Co. at Willow Run, Mich. — were needed to keep up with the wartime demand.

Ironically, the first six Liberators off the San Diego assembly line in 1940 were not U.S. Army Air Corps B-24s. They were British LB-30As (Land Bomber, export designation 30), and the first Liberator to see combat was a British LB-30B. In late 1940, an English aviation writer said the Liberator was "the best military aeroplane ever built in America."

The U.S. Eighth Air Force flew B-24s from England to France in 1942 and deep into Germany in 1943. B-24s also led the first bombing raid through flak-filled skies to open the decisive air battles over Berlin. Later, American B-24s flew in waves on D-Day, bombing French invasion beaches in predawn darkness.

B-24s pounded every important target in Europe, but their most spectacular and most costly mission was the second attack on the oil fields and refineries at Ploesti, Romania, in August 1943. Aircraft from the Eighth and Ninth Air Forces put on an all-Liberator show. They faced murderous anti-aircraft fire on their low-level attack. The cost of the 2,700-mile round-trip mission from Libya was high: 54 of 177 planes fell while knocking out more than 40 percent

of the refineries' capacity. Five airmen received the Medal of Honor for that single mission.

In the Pacific, Liberators gradually replaced the B-17, largely because

In the Pacific, Liberators gradually replaced the B-17, largely because of the former's extensive range. For most of the early years of the war, the B-24 and its Navy counterpart, the PB4Y-1 Liberator, were the only American heavy bombers covering the seas from Alaska to India. The later PB4Y-2 Privateer, a modified B-24 with a single, tall vertical tail, was

generally considered the Navy's most deadly bomber.

Two other versions of the Liberator, the C-87 Liberator Express personnel-cargo transport and the C-109 Flying Tanker, helped make history "flying the Hump" over the Himalayas in the China-Burma-India theater of operations.

The B-24 did not receive as much public acclaim as did the B-17 and, later, the B-29 Superfortress. But its crews usually considered the B-24 a good and faithful servant, and it has won a solid place in history.

■ Ed Williams



Cessna has received more than 90 orders for its new Citation V business jet.

Citation V

(Continued from Page 1)

"What surprises us isn't the success of the Citation V," Norris said. "What surprises us is that it has continued to sell despite the lead time of a year and a half to a year and three quarters when a competitor's model can be bought off the ramp. The fact that customers are prepared to wait for our plane tells us we've got something that's much better."

Two Citation Vs are performing flawlessly on a grueling five-month, round-the-world demonstration tour. The trip began May 19 and consists of 119 stops on six continents before ending at the National Business Aircraft Association convention in Atlanta on Oct. 3.

"This is something that is unprecedented for a new model business aircraft, fresh out of the factory," Norris said. "The remarkable journey reflects the absolute confidence we have in the reliability and capability of this latest member of the Citation family.'

Powered by Pratt & Whitney JT15D-5A turbofan engines, the Citation V spans the gap between traditional light jets such as the Citation II and S/II and the larger, more expensive midsize jets such as the Citation III. And like the Citation I, II and S/II, the Citation V

has been approved for single-pilot operation.

The aircraft has extensive state-of-the-art avionics. The Honeywell EFIS long-range navigation systems and P650 radar systems and thrust reversers, options on most midsized business jets, are standard equipment in the Citation V. It has a maximum cruise speed of 429 knots, an increased certified altitude of 45,000 feet and a range of 1,960 nautical miles. The base price for a standard-equipped Citation V is just under \$4 million.

Those features have made Citation V a best-seller not only in the United States, but Europe as well.

"At the Paris Air Show, we normally don't take orders for airplanes because most people are there to review," Norris said. "But this year, we sold four at the show and took orders for four more just after the show was completed. I've never seen anything like it. It truly is the best fit for the typical business traveler's mission.

"We're extremely pleased and delighted that General Dynamics was willing to invest in the Citation V the way it has. Cessna sales and earnings were way down at the time that decision was made, but the risk has paid off handsomely for the company."

Myron Holtzman

AFTI/F-16 begins close air support testing at Edwards

The Advanced Fighter Technology Integration/F-16 aircraft has entered a new phase of flight testing related to close air support.

The tests began in July at Edwards Air Force Base, Calif. They are demonstrating technology for two-ship, "internetted" close air support of ground forces over any type of terrain, day or night. The aircraft demonstrated the basic technology for data-link operations with an automatic target handoff system in tests last

The automatic target handoff system allows the transfer of direct, digital information about target location without relying on voice radio, which is susceptible to error.

The new tests will allow the aircraft to work in tandem with an F-16B and a remotely piloted vehicle. In tests planned for September at Fort Hood, Texas, the AFTI/F-16 will act as a spotter and relay target information to the F-16B for subsequent attack. In tests at Fort Sill, Okla., the remotely piloted vehicle will scout and relay target information through a ground control station to the AFTI/F-16 for attack.

Other tests will evaluate a ground collision avoidance system based on the AFTI/F-16's color digital map system and a night-attack capability using helmetmounted displays and image-intensifying tubes, according to Maj. Myres N. Drew, AFTI/F-16 program manager at the U.S. Air Force's Flight Dynamics Laboratory.

The two-ship tests are scheduled for the rest of the year, according to Willie Bennett, Fort Worth's program manager for AFTI and close air support.

Space Systems given award for contracting with small businesses

The U.S. Small Business Administration recently picked Space Systems as its Region IX Distinguished Prime Contractor for 1988.

Space Systems received the award for actions that included: increasing small business commitments to 63 percent from 12 percent in 1987; increasing small disadvantaged business commitments to 5.5 percent from .3 percent in 1987; establishing buyer incentive and engineering outreach programs; completing compliance with General Dynamics' "Fifteen Elements of an Excellent Small Disadvantaged Business Program;" developing an on-line small and small disadvantaged business data base; publishing a quarterly small business newsletter; and participating in civil- and government-sponsored councils, seminars, trade fairs and meetings.

General Dynamics selected Space Systems as its representative in the competition after reviewing all of the divisions' detailed descriptions of their small business and small disadvantaged business programs.

Space Systems' entry competed against others in Region IX from Arizona, California, Guam, Hawaii and Nevada. A panel of independent judges determined the winner.

European engineers take to life in Texas

Twenty-eight European engineers have spent from has become quite a basketball player. The Agile two months to more than a year in Fort Worth helping develop the multinational Agile Falcon and F-16 Mid-Life Update. The program improves the F-16 to teams. counter turn-of-the-century combat threats.

on the program, says the "Agile Falcon European experience," as he terms it, has been a productive technical and cultural exchange.

understanding of each other's techniques and pro-siast, bought a Corvette while in the United States. cedures, which should serve us both well in future international programs," Doyle said.

At the same time, the program has given the Fort Worth, Belgian, Danish, Dutch and Norwegian participants enough personal memories to fill a dozen scrapbooks.

learning to pronounce such words as Norsk Forsvarsteknologi, Tjaard Sypkes and Max Schrijvershof, the respective names of a Norwegian company and two Dutch engineers working on the program.

the Europeans who picked up their families and their lives, or left their families and their lives back home, and moved to Texas," Doyle said.

The Europeans have taken part in many activities during their stay in Fort Worth. "There have been ski trips to Colorado, white-water rafting trips in several different states and vacations to Florida, Hawaii, California and Washington, D.C.," Doyle said. "Some of the Europeans have taken up golf and one

Falcon personnel have also staged a softball game with the Europeans divided between two opposing

"After playing softball, the Europeans challenged Chuck Doyle, Fort Worth's deputy chief engineer the Agile Falcon management to a soccer game but we haven't found time to do that, for various reasons," Doyle joked.

One of the Europeans is an accomplished classical "The experience has provided a unique opportunity guitarist and another plays trumpet with local for European and U.S. engineers to develop a better groups. Denmark's Klaus Nilsen, a sports car enthu-

> The Netherlands' Peter Rooijmans has also experienced American sports cars and speed limits. As a result, he is the only Fokker engineer who holds a Texas defensive driving certificate.

But the Europeans have shopped for more than cars. "Books have been a favorite purchase of many For the Americans, the main challenge has been Europeans because they are relatively expensive in their home countries," Doyle said. "As one might expect, aircraft books top their list."

Because of budget cuts, the Agile Falcon program will be put on hold after December. Fort Worth's "This was only a minor adjustment, compared to Dwain Mayfield, vice president - program development who was director of the program until recently, said work on the F-16 Mid-Life Update will continue next year. U.S. and European engineers will define an F-16 configuration incorporating advanced 1990s

> Many of the same Europeans will be participating in the program either at Fort Worth or in their own countries, Mayfield said. **■** Joe Stout

	Annual Rate of Return for the 12 Month Period Ending:		
Salaried	June 1987	June 1988	June 1989
Government Bonds	6.4%	7.4%	8.5%
Diversified Portfolio	27.6%	(6.2)%	21.0%
Fixed Income	11.8%	11.0%	10.5%
Hourly			
Government Bonds	6.6%	7.7%	8.7%
Diversified Portfolio	28.9%	(6.4)%	21.5%
Fixed Income	11.8%	10.9%	10.4%
GD Stock Closing Price	\$66.75	\$53.00	\$58.25



HERE'S THE PITCH. San Diego Urban League representative Charles M. Fort (left) and Lucy Breakfield, an Electronics Division employee who volunteers for the group, give their volunteer recruiting pitch to Walt Robertson (right), Electronics vice president and program director-automatic test systems, and Paul Bokros, Electronics vice president-operations. The event was a recent community relations fair at Electronics to attract volunteers for a variety of San Diego agencies. More than 300 Electronics employees attended the fair.



OUT TO LAUNCH. (Left) Space Systems' Atlas booster that will launch a Navy satellite in September is erected in the tower at Launch Complex 36B at Cape Canaveral, Fla. (Right) The Centaur upper stage is hoisted up the tower to be stacked on top of Atlas. September's launch will be the last for the National Aeronautics and Space Administration before General Dynamics begins commercial Atlas launches from the pad next year.

NASP 'could overshadow' Apollo

Two days after Vice President Quayle visited San Diego, and on the same day that President Bush made important announcements about U.S. space policy, approximately 400 people gathered in Dayton, Ohio, for the first National Aero-Space Plane Conference, which focused on the national effort to develop a hypersonic research aircraft.

Fort Worth's Armand Chaput, director of General Dynamics' NASP team, spoke at the conference. Chaput discussed the importance of the program to American competitiveness in the international aerospace market of the 21st century.

Another speaker, retired Air Force Gen. Larry Skantze, predicted that the effort "will someday overshadow Apollo, in terms of its payoff."

"This program is the beginning of an era that will change the world just as the airplane did and just as supersonic flight did," said Dr. Robert Barthelemy, director of the NASP Joint Program Office, which includes Air Force and NASA personnel.

Barthelemy said the program "is taking on the toughest possible performance—single stage to orbit by an airplane."

Conference participants from England, West Germany and Japan also presented technical reports on efforts to develop space plane technology in their nations.

The future of the program depends on budget action. The White House National Space Council has recommended that construction of the X-30 NASP research aircraft be delayed by more than two years, but that total funding for the technology phase of the program be increased.

General Dynamics is one of three airframe companies working competitively on preliminary X-30 vehicle design. Two engine companies are developing propulsion systems for the vehicle.

■ Joe Stout

Quayle

(Continued from Page 1)

space launch systems you build here that support both our government and private sector activities, I feel that I have gotten a brief glimpse of the future," he said.

Quayle is chairman of the National Space Council, the president's space advisory board. During his remarks, Quayle expressed the administration's support for the X-30 National Aero-Space Plane, the space station Freedom and private sector initiatives in space.

On July 20 in Washington, Bush expanded on Quayle's comments by calling for establishment of a lunar base in the 1990s and launch of a manned mission to Mars in the next century.

The vice president paid tribute to the gains in technology and education created by the Apollo program. Quayle compared the moon landing in 1969 to the discovery of the New World by Columbus in 1492. He said that the time is at hand for the space equivalent of the pilgrims landing on the shores of Plymouth Bay.

"We must begin to think about the voyage of a new Mayflower — about expanding the presence of humans into the solar system as a long-term goal," he said.

The vice president added that the adventure of Apollo 11 and the first human voyage to the moon has not ended.

"Having opened the door to the infinite reach of space with Apollo 11, we must not hesitate at that threshold," Quayle said. "We are a nation of pioneers, and we welcome the challenge of the unknown."

■ Julie Andrews

Atlas played major role in moon landing

During the 20th anniversary celebration of the moon landing last month, people at Space Systems paused to remember that many of the missions launched by Atlas and, later, Atlas/Centaur led the way for the Apollo program and the first voyages of man to the moon.

In 1966 and 1967, Atlas/Agena launched five lunar orbiters that took thousands of photographs of the moon's surface. The photos helped determine landing sites.

The first operational launch of Atlas with the Centaur upper stage took place in May 1966. It carried Surveyor I, the first spacecraft to soft-land on the moon. Six more Surveyors rode into space atop Atlas/Centaur, and these missions all landed hardware on the moon's surface. The Surveyors took soil samples, sent back photos and tested the spacecraft's ability to ascend or descend in the moon's atmosphere.

"There was a lot of pride and a lot of excitement for almost anyone who was associated with those programs," said Judd Giesenschlag, manager of Atlas E program control, who has been involved with the company's space programs for 37 years. "I think most of us at that time probably grew up thinking of the future of rocket travel and some day going to the moon."

Added Phil Genser, manager of Centaur and Atlas applications who has spent 33 years on the company's space programs: "Our Atlas made the early steps possible by launching moon probes and placing the first men into earth orbit. I'm not sure that everyone working on the early Atlas programs had in mind the goal of putting a man on the moon, but without those early steps, we could not have done it."

Keel named year's top alumnus

The alumni association of California State University-Long Beach has named Valley Systems Division General Manager Mike Keel its distinguished engineering alumnus for 1989.

A native of Los Angeles, Keel received his bachelor of science degree in electrical engineering from the university in 1963.

The award was presented to Keel as part of the engineering school's 1989 commencement ceremony. The association makes the award each year to an alumnus from each school who is an outstanding example of professional achievement and distinguished service.

In addition to his undergraduate degree from Cal State, Keel also earned his master of science degree in systems engineering from West Coast University, Los Angeles, in 1964.

PHOTOS BY TIM WHITEHOUSE

Price is right

Company finds federal labs precious, low-cost resources

HE ENGINEERS AT Fort Worth Division were seeking assistance on composite materials for the X-30 National Aero-Space Plane project.... Space Systems sought help in building superconducting magnets.... Land Systems was looking for aid in its search for new armor-plating technology for M1A1 tanks.... Laser Systems Laboratory needed information on a wave-length converter system for its submarine laser communications program.

While each of the General Dynamics affiliates could have turned to its own scientists and engineers for solutions to the problems, each chose an alternative — the Federal Laboratories Consortium.

"It is a low-cost method of extending the General Dynamics technology base," said Dr. Marvin Hammond, the director of technology at the Defense Initiatives Office.

"It's a huge center of science expertise," said Dr. David Freiwald, the director and general manager of Laser Systems.

Organized in 1974 to promote and strengthen technological transfer nationwide, the consortium is a group of national technology laboratories that link private industry with government laboratories.

"We want the divisions to discover and identify the technologies at the consortium that can benefit General Dynamics," said J. Clifford Schoep, corporate director-

"It's a win-win situation.
We share in their
technological
expertise...and they can
learn from us."

—Dr. Marvin Hammond

research and advanced development. "We normally deal with the service laboratories within the Army, Navy and Air Force. However, in the past couple of years, we've been working to make our engineers more aware of the federal labs' capabilities.

"Our interest is to take advantage of research already done by the government so that we don't duplicate that effort ourselves. That saves time, energy and money."

At Fort Worth, engineers needed a structural material for the X-30 that could withstand temperatures up



Fort Worth's Dr. C.K. Unni turned to the Federal Laboratories Consortium for help with materials for the X-30 National Aero-Space Plane.

to 3,000 degrees Fahrenheit. Dr. C.K. Unni, an engineering specialist at the division, considered the use of nickel aluminide—a unique alloy. He had experimented with the material for the X-30 on a small scale for about a year.

Unni and the other project engineers at Fort Worth turned to the consortium lab at Oak Ridge, Tenn., because "they have developed several different nickel aluminide alloys with unique high-temperature capabilities," Unni said. "Oak Ridge was using their technology to develop monolithic nickel aluminide for other applications. Now, we're developing it as a lightweight, high-temperature composite for structural applications under a joint program."

Meanwhile, Laser Systems Laboratory in San Diego is working with the lab in Los Alamos, N.M., on Raman processing—a special laser converter system for use in a submarine communications program.

"We've taken their ideas and upgraded them to the point where we're now ahead in the technologies directed for our application," said Freiwald. If the system is developed, General Dynamics is free to patent or copatent the process, he added.

The strength of the network is its ability to let users contact a federal laboratory person with expertise in a particular area. Classified data is available to those with proper clearances.

"There's hundreds of billions of dollars of technology out there that's free to industry if someone goes and looks for it," said Freiwald, who ran the technology transfer program at Los Alamos before joining General Dynamics.

"It's a win-win situation," Hammond said. "We share in their technological expertise, which gives them justification for continual federal support. And they can learn from us about potential 'real world' application of their work."

Hammond recently visited several consortium labs, discovered about 40 projects that might apply to General Dynamics developments and reviewed some possibilities with the aerospace divisions.

"We've even been given permission to underwrite technology sabbaticals to the laboratories so our engineers can work directly with their staff on key projects," said Hammond, who encourages interested people to contact him. "Within those laboratories there's a wealth of technology on which General Dynamics should capitalize.

"Those technologies would permit us to expand our capabilities at a low cost, which in turn aids us in both winning new programs and helping to improve our profitability."

Myron Holtzman

Novel Convair paint system helps clear the air

With the swipe of an employee identification badge and the wave of a bar code reader wand, a Convair painter activates a computerized monitoring program that is an important part of the division's environmental resource management.

The program, called the paint emissions management system, was developed jointly by Data Systems Division-Western Center and Convair. It monitors the composition of coatings being applied in 22 paint booths at the Lindbergh Field plant in San Diego.

"Convair operates under an equivalency plan in reporting paint emissions to the Air Pollution Control District, as we are required to do under the Clean Air Act," said Don Stewart, Convair environmental engineer. "We use pluses inherent in some coatings to offset minuses in others. To maintain this plan we must provide a daily record of coatings used in every paint booth."

Before the new system, painters kept records manually. The data was summarized on spread sheets and entered into a computer. It not only was time-consuming, but one year's worth of records filled a 3-foot-long shelf.

Convair asked the business systems development group at Data Systems-Western Center for help. Over the next six months, the team of Ed Bentz, Tim Curley,



Production painter Felix Delgado (left) reads a bar code to activate a paint monitoring system as operations representative Stan Wells enters the paint quantity to be used.

Valerie Kohls, project supervisor Larry Faast and project leader Dale Cooley developed the paint emissions management system using computer-aided software engineering.

Data Systems is patenting the new system's software. Faast noted that because it is the first of its kind, the system could be marketed, particularly if the State Air Resources Board advocates such a system for other companies. The district has approved the entire system.

The same terminals that record labor in the factory operate the paint system. Bar codes for paint booths and coatings are posted next to the terminal. A painter begins a job by activating the terminal with an identification badge. Then, he or she uses a bar code reader wand to enter the type of coating and keys in the amount. When the job is done, the painter enters the amount of paint discarded. The computer does the rest. Frank Glenski, manufacturing technology engineer, keeps the system updated with calculation data as coatings are added or replaced.

"In real time we can see the data for any paint booth and any coating, and we can monitor the daily use against the maximum level Convair operates under," said Stan Wells, operations representative, who worked closely with painters and supervisors in implementing the system. "The data can also be used to project future use and quantities needed so as to not overstock inventory."

WOORLD Volume 19 Number 9 September 1989

Rising costs affect GD medical plan

Two major changes in the company's medical program for non-union salaried and hourly employees will take effect Jan. 1.

At that time, all divisions and the Corporate Office will uniformly have comprehensive medical plans as their existing medical plan. This uniform plan is Option E under the Dynaflex benefits package.

The second change adjusts the benefit allowance so that each employee selecting Option E will contribute \$2 a week for individual coverage or \$4 a week for family coverage.

The main features of Option E will be:

- \$100 individual and \$200 family deductibles
- 80 percent company and 20 percent individual sharing of medical costs
- \$1,000 individual and \$2,000 family out-of-pocket limits
- \$500,000 lifetime maximum coverage for each individual

President and Chief Operating Officer Herbert F. Rogers said the rapid escalation of medical costs has made it necessary that employees share further in medical coverage costs.



Rogers said that this action puts General Dynamics in line with other large firms in the country. A recent survey by Foster Higgins of New York of more than 1,600 U.S. firms cover-

ing more than 10 million employees indicates that approximately 70 percent require some contribution by employees.

"We will still be providing excellent coverage at a nominal cost," Rogers said. "The out-of-pocket limit protection against large or catastrophic medical expenses remains an integral part of our medical plans, and that is an extremely valuable feature."

(Continued on Page 2)

Frankovsky to direct TQM effort

Joseph A. Frankovsky has been appointed to the newly created position of staff vice president-total quality management. He will lead companywide efforts to enhance work-flow processes through TQM, an industry philosophy emphasizing systematic and continuous improvement in the way products are designed, manu-

factured and brought to

market.

Frankovsky, 54, has more than 30 years of high-technology industrial experience in key positions at IBM. He has most recently been a consultant with IBM and Xerox.

Frankovsky recently answered the following questions concerning TOM.

Q: We've seen a lot of different definitions of TQM. Why is it so important to define it?

A: TQM's definition is important to gain an understanding throughout any division, department and company of the value

that total quality management has for all of us.

Q: What about the "how" of TQM?

A: Continuous process improvement means setting a target to improve, reach it, and set a new target — by focusing on the process, doing things better every day,

every week, week after week.

Total quality management needs everyone to make it work. The full power and capability of TQM does not get turned on unless everyone makes it work.

Q: What's in TQM for the employee?

A: If we all improve quality and keep on improving

quality in everything we do, a lot of good things happen for our customers, for us individually and for our divisions and our company.

By making the customer better off, we make ourselves better off.

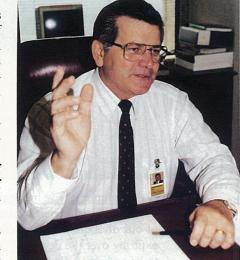
Q: What makes TQM different from past slogans and catchwords such as "zero defects," "do it right the first time," etc.?

A: TQM is an investment of time, resources, leadership and people to be competitive in a very competitive world. It is a cohesive strategy used all over the world. People and companies together are making great progress using quality as their principal strategy.

But customers, who themselves must be competitive, are making it well-known that quality is much more than defect-free products. Defect-free products have to be a given. Customers are insisting on total,

reliable and timely solutions at the right prices.

There have been significant demonstrations by the Japanese and, to some degree, U.S. companies, that TQM is the leverage, the philosophy and the break(Continued on Page 3)



Joseph A. Frankovsky

M1 Abrams goes where other tanks fear to tread

The U.S. Army Cold Region Test Center proved the ability of the M1 Abrams tank to operate in severely cold weather, according to a report recently released by the Army.

The tests in cold, snow and ice at Fort Greeley, Alaska, verified that 20 product improvements performed in weather of at least minus 25 degrees Fahrenheit.

Temperatures as low as minus 64 degrees were

encountered during the 500-mile, 113-hour test. Special attention was given to the performance of low maintenance batteries, personnel heaters, JP8 fuel, electronic-control-unit batteries, the driver's thermal viewer and the hydraulic manifold thermal bypass valve.

While cars refused to start, testers started the tank 89 times. They constantly challenged the tank, often selecting the most severe weather and terrain condi-

(Continued on Page 2)

News Briefs

Contract to launch 10 satellites marks big GD breakthrough

General Dynamics achieved what company officials called "a significant breakthrough" when Space Systems' General Dynamics Commercial Launch Services Inc. recently received a contract to launch 10 satellites.

The contract is with Hughes Aircraft Co.'s Space and Communications Group to provide launch services for U.S. Navy Ultra High Frequency Follow-On communications satellites.

"This is a significant breakthrough in our efforts to capture a major share of the commercial launch market," said Alan M. Lovelace, president of Commercial Launch Services. "Selection of our Atlas for this important program is another indicator of the increasingly growing recognition of General Dynamics as the dominant U.S. provider of launch services."

Submunition contract won

Valley Systems Division has received a \$19 million contract from the U.S. Army Missile Command for work on the Infrared Terminally Guided Submunition.

The contract moves Valley Systems a step closer to its goal of a third product line. The division makes Stinger anti-aircraft weapons and is about to start production of the Rolling Airframe Missile.

During the next 24 months, the division will design, fabricate and test hardware for captive and free-flight demonstrations of the submunition.

The submunition is a candidate for use in the Army Tactical Missile System, a long-range delivery vehicle. The system's primary mission with the submunition is to disrupt the movement of tanks, armored personnel carriers and trucks.

Blood donations recognized

General Dynamics has been named the only recipient of the American Association of Blood Banks' Presidential Award for 1989.

The blood centers that nominated General Dynamics are near company facilities in Texas, Connecticut, Rhode Island, Missouri, Michigan and California, and represent five districts in the blood banks association.

General Dynamics employees nationwide donated 17,945 pints of blood in 1988.

New module for Tomahawk

Convair will design and use an updated recovery exercise module and range safety system for the Tomahawk cruise missile under a recently awarded \$27 million contract.

The module is installed in missiles that are to be flight tested, enabling the missile to be recovered by parachute once the flight is over.

Gift buys rehabilitation help

Patients at the Casa Colina Hospital for Rehabilitative Medicine in Claremont, Calif., have another tool to help in their recovery, thanks to a \$37,000 grant from General Dynamics.

The money purchased a machine that uses a computer to analyze patients' exercises.



THE RECENT SELECTION of Space Systems' Atlas vehicle by Hughes Aircraft Co. to launch 10 Navy communications satellites is detailed elsewhere in this issue. The win is a key one for the company's San Diego-based space experts who, under General Manager Al Lovelace, have labored long and hard to preserve GD's 40-year legacy as America's leading producer of reliable launch

The estimated half-billion-dollar contract was big news not just in San Diego, but around the country. In New York, aerospace analyst Jerry Cantwell (Wertheim-Schroder) said that the award "clearly established General Dynamics as the dominant market player." Analyst George Podrasky of Duff & Phelps, quoted in the Los Angeles Times, said, "It's very important...they had assumed a lot of risk in going ahead with the commercial Atlas and the chance they took proved to be the correct one." Meanwhile, San Diego Union interviews with other industry observers prompted the following comments:

"General Dynamics has emerged as the winner in the commercial expendable launch vehicle competition." (Bill Detherage-Dean Witter Reynolds)

"It could have been a tremendous flop for GD if they hadn't made the sales. But they made the sales and it's paying off in spades." (Paul Nisbet-Prudential-Bache Research)

"In two short years, they've proven they can make money in this business. They've had success in a shorter period than many of us thought possible." (Judith Comeau-Goldman Sachs & Co.)

The bottom line is that the GDSS team brought home a significant and well-deserved win.

FOR THE FIRST TIME since 1940, a new daily newspaper will be introduced in a major U.S. metropolitan area. St. Louis will once again be a two-newspaper city when the St. Louis Sun, a seven-day, morning tabloid, debuts on Monday, Sept. 25. When it comes to the news (unlike defense products), the consensus is that it's not only healthy but mandatory that there always be a second source.

GEN. COLIN POWELL'S selection as chairman of the Joint Chiefs of Staff was received with loud and near-unanimous applause. The 52-yearold New Yorker brings more than 31 years of military service to the post. A sampling of Powell's "rules to live by," as reported in *Parade*:

- "It ain't as bad as you think. It will get better in the morning."
- "Get mad, then get over it."
- "It can be done!"
- "Be careful what you choose. You may get

Employee input key to survey

(This is the final column on the Survey of Employees employees. Department work groups will then meet that will appear in General Dynamics World before the survey is taken.) upon.

The second General Dynamics Survey of Employees is only weeks away. The survey is scheduled to begin Oct. 2 and continue through Nov. 3.

"General Dynamics is firmly committed to a process of continuously improving the way in which we do our work — the systems, the processes and the policies," said Chairman and Chief Executive Officer Stanley C. Pace. "The survey is a key element in that process."

As in 1986, the results will be made available to all

to identify the key concerns to be acted

Supervisors are encouraged to work directly with employees to solve those concerns. In this way, resources will be focused on those areas that will make the most significant improvement in performance.

"Again, this is very important to the company," Pace added. "I urge you to give your candid opinions on the matters being surveyed. Your input will help guide the actions taken to address current concerns

and to shape future planning."



Medical

(Continued from Page 1)

Rogers said that since Dynaflex provides other medical options from which employees may choose their coverage, "employees will be able to select a plan that is less expensive, or they may choose a plan that provides a higher level of coverage dependent on their individual needs."

A letter by Rogers announcing the changes was recently sent to more than 53,000 salaried and nonunion hourly employees with the company.

Following are some questions and answers regarding the changes:

Q: Will all affected employees contribute the same amount in 1990 for benefits option E?

A: All affected employees will contribute either \$2 per week for individual or \$4 per week for family coverage under option E.

Q: Will there be increases after 1990 in the amount paid by employees?

A: This is a difficult question to answer. However two points can be made:

First, there has never been a time when we have faced a more pressing demand to be competitive. Projections of future defense budgets indicate this environment will be even more challenging.

Second, our divisions have experienced anywhere from 15 percent to 35 percent annual escalations of medical costs over the past three years. If other cost containment efforts are unsuccessful and medical costs keep rising at present rates, it is likely employees will be asked to share in those increased costs. However, this could be done either through plan design changes or increased employee contributions.

Q: Was Dynaflex introduced to pave the way for employee benefits contributions?

A: No. The company did not anticipate that medical

costs were going to increase at such a rapid rate. These rapidly escalating costs would have required the company to take this step under the old single-plan system. With Dynaflex, employees have the advantage of electing the coverage they need: more coverage through greater contributions or less coverage with lower contributions.

Q: Why do we have to pay for benefits when the company's sales, earnings and backlog are going up, according to our most recent quarterly report? Is this going to lead to more take-aways from employees?

A: The backlog and current business of the company is due to continued attentiveness to being competitive. Where the company has not been mindful of its costs, it has suffered loss of earnings and hasn't positioned itself well for some major competitions with other companies. We must continue to manage our costs to be successful. The efforts we put forth now will have a big impact on the company's future business success and on each employee's job security.

Q: Can such a small amount per individual really make a difference to GD, which had sales of over \$9 billion last year?

A: Yes, it does make a difference. For most divisions, along with the change to comprehensive plans, it will keep 1990 medical costs in line with 1989 costs, which is an important consideration to competitiveness.

Q: Are union employees going to be similarly impacted?

A: Comprehensive medical plans and employee contributions have been negotiated at some locations. Most of our divisions have collective bargaining agreements expiring over the next three years. This issue will have to be addressed during each of those negotiations

M1 Abrams

(Continued from Page 1)

tions. For example, the crew started and operated the tank at minus 54 degrees while the specification calls for operation at "only" minus 25 degrees.

During operation, the heaters maintained temperatures inside the tank well within the comfort range despite the severe external temperatures. The tests also verified that the modified thermal bypass valve improved the warm-up rate of the tank's hydraulic system.

Inspections and analysis after the tests established that the tank performed to cold-weather specification with no component problems.

Winter tests at Fort Greeley, Alaska, verified the cold weather performance of 20 product improvements on the Abrams tank, according to recent reports.



RAM paves way for Valley Systems' second line

HE GO-AHEAD for initial production of the Rolling Airframe Missile means much more than a contract award to Valley Systems

The \$85.6 million award, made in July by the U.S. Naval Sea Systems Command, gives the division its second program to enter production along with the Stinger anti-aircraft weapon.

"Having a second product line gives the division a better financial base," said Joe Pennisi, Valley Systems vice president and program director-Rolling Airframe Missile and launcher systems. "RAM's benefits also include broadening our customer base to include the U.S. Navy and West Germany, and providing several hundred new jobs."

The weapon, which intercepts anti-ship missiles, promises to be a long-term production program to equip the navies of the United States and West Germany. Valley Systems will make 500 missiles in initial production, and the U.S. and West Germany agreed in 1987 to plan for the purchase of 7,000 missiles. "We view 7,000 as a bare minimum," Pennisi said.

Manufacture of the 500 missiles will run through 1992. Pennisi expects follow-on production to go to at least 1997. Assembly could continue beyond that date if the United States and West Germany increase their orders or other nations make purchases.

The missiles will be assembled in a 400,000-square-foot building opened at Valley Systems' Rancho Cucamonga, Calif., headquarters last year. Other work by General Dynamics will be done at Pomona and Electronics divisions and at Valley Systems' recently dedicated Navajo facility near Farmington, N.M. Meanwhile, production lines will also operate in West German locations owned by Ram System GmbH, a joint venture of four German firms. After completing initial production, Valley Systems will compete against Ram System GmbH for annual production.

Launchers will also be built for the missile system. Valley Systems and West German industry have formed a joint venture company, Translant Inc., to make the launchers. Translant has proposed to produce 50 launchers. Contract go-ahead from the United States and West Germany is expected this month.

The Rolling Airframe Missile system is unique because it was cooperatively developed by two nations, the United States and West Germany. Denmark was an original sponsor of the system, but has elected to become a dormant partner. Denmark can return as a sponsor, but must provide appropriate funding to regain that status.

A system such as the Rolling Airframe Missile is needed to counter a growing worldwide inventory of anti-ship missiles that is predicted to reach 40,000 by 1997. Anti-ship missiles sank the British destroyer *Sheffield* during the Falklands War and severely damaged the U.S. frigate *Stark* in the Persian Gulf.

The Rolling Airframe Missile and its 21-round launcher can be mounted on any ship. A 10-round alternate launcher is being developed for small craft with weight limitations. The missiles can be fired in quick succession and find targets without guidance from their launching ships.

"The RAM weapon system offers unprecedented protection against anti-ship missiles because of its fire-and-forget, passive guidance operation," Pennisi said. The system provides coverage at intermediate ranges. It engages other missiles at distances that are far enough to prevent debris from hitting the targeted ship.

Another General Dynamics product, the Phalanx gun system, can be combined with the Rolling Airframe Missile. The Phalanx radar can be hooked up to point the Rolling Airframe Missile launcher. Such a system has been successfully demonstrated against incoming targets in tests aboard a Navy destroyer.

"There is a good future for RAM because of the Phalanx combination, the lightweight 10-round

▼ A Rolling Airframe Missile is fired from its launcher aboard a Navy ship.



Frankovsky

(Continued from Page 1)

through all companies need to participate in today's market.

TQM is not optional.

Q: Aren't we really talking about a change in people's attitudes, a perception revolution?

A: Yes. This means management support and leadership to establish a TQM environment that excites, enables and empowers each one of us in a new partnership with customers, suppliers and employees.

General Dynamics has the greatest opportunity and the best potential of any company I know to make a big quality contribution to its customers, suppliers and employees through TQM. The General Dynamics ethics program taught us that trust is a very important value. We have to build on that trust to make the cultural change in GD happen.

We have to move to a consensus and participative management style. We have to move from finding and correcting defects to preventing them.

Q: What benefits have been realized by defense companies that have adopted TQM?

A: TQM is new in the U.S. defense industry. Many companies in commercial industry have delivered significant changes using continuous process improvement. The results have been five to 10 times improvement in reliability, 10 times reduction in defects and significant reductions of time, by half in many instances, to develop and manufacture products.

The most important advancements were the knowledge capture of the process improvement, and the prospects of even more benefits offered by these new processes.

Q: What tangible steps must the company take to adopt TQM?

A: General Dynamics is preparing to make TQM and investments in TQM a long-term strategy for all of us. Key steps include setting a vision and gaining participation with a very solid and well-thought-out implementation plan. This includes the education we all need for this cultural change.

launcher, likely orders from a number of other navies, and an upgrade of RAM's infrared seeker," Pennisi said. A contract has been negotiated to improve the seeker to home in on anti-ship missiles employing active radar guidance.

The Rolling Airframe Missile system will undergo operational evaluation late this year and in early 1990. The precursor to that evaluation, contractor testing, resulted in a direct hit at White Sands (N.M.) Missile Range. The next step in contractor evaluation will be over-the-water testing.

■ Dave Lange

Stinger inspectors can find no faults in random teardown

When representatives of Valley Systems Division and the Naval Plant Representative Office recently disassembled a randomly selected Stinger Reprogrammable Microprocessor, they made a historical discovery: no faults.

For the first time since the formation of Valley Systems in October 1985, the inspectors found no discrepancies in their quarterly teardown of the guided missile assembly for the Stinger anti-aircraft weapon. The unit was disassembled at the division's Sycamore Canyon Facility in San Diego County.

"This milestone has been primarily achieved through the efforts of all employees involved in the manufacture and support of the Stinger-RMP program," said Jim Park, Valley Systems vice president-quality assurance.

Stinger teardowns have proven extremely valuable, Park said. The teardown has enhanced the quality of the hardware and allows for immediate employee feedback to correct problems, he added.

"A teardown consists of disassembly and inspection to the lowest practical level of a completed unit," Park said. "All findings are documented, discrepancies are categorized as to mission impact, and corrective action is taken to ensure that discrepancies are corrected for enhanced quality on all future products."

Although the second-quarter inspection resulted in the first no-discrepancy finding, Valley Systems has always had a good record in the teardowns. The categories that classify teardown discrepancies are minor cosmetics, no mission impact, potential mission impact and high mission impact. "In all the years that the quarterly teardowns have taken place, we have never recorded potential misson impact or high mission impact," said Lisa Stuessel, a quality analyst who chairs Valley Systems' Product Quality Verification Evaluation Team.

The team is present when a Navy representative randomly selects a guided missile assembly for teardown. The team includes representatives from the Stinger Program Office, production, research and engineering and quality assurance, as well as the Navy office.

The team tears down the assembly with the help of Valley Systems employees from Sycamore Canyon and division headquarters in Rancho Cucamonga, Calif. The team manages disassembly and inspection of the hardware, records the results, prepares findings and generates any corrective action. The launch tube and guidance section are returned to Rancho Cucamonga to complete the teardown.

■ Jerry Littman

GENERAL DYNAMICS

World

Published by: General Dynamics Corporation Pierre Laclede Center, St. Louis, Mo. 63105

Manager of Internal Communications: Dave Lange

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Savings and Stock Investment Plans Annual Rate of Return for the 12 Month Period Ending: July July July Salaried 9.6% Government Bonds 5.8% Diversified Portfolio (11.0)%42.4% 31.5% Fixed Income 10.9% 10.4% Hourly Government Bonds 6.0% 9.7% Diversified Portfolio 44.8% (11.4)%32.3% Fixed Income 11.8% 10.9% 10.4% GD Stock Closing Price \$67.87 \$52.87 \$58.37 () Denotes Negative Number

Donations help fund children's hospital

Fort Worth employees shared a proud moment in their community recently when one of the most modern pediatric care facilities in the nation, the Cook-Fort Worth Children's Medical Center, opened its doors.

General Dynamics provided \$200,000 for two major elements of the facility, including \$100,000 donated by the Employees' Con-Trib Club at the division. The Con-Trib Club, primarily funded by payroll deductions, supports United Way agencies and other causes on a need-by-need basis.

The new hospital is a true community effort. Donations funded about 50 percent of the \$53 million construction cost. The non-profit institution combines two smaller children's hospitals dating to the early 1900s.

General Dynamics funded the facility's patient registration area and a bone marrow purging unit that will be used in treating cancer patients. The hospital is only the third in the nation with the capability for immunomagnetic purging, a procedure that removes cancer cells from bone marrow with a system of magnets.

The facility is noted for architecture that is "designed to not look like a hospital and to make younger patients feel more comfortable," said Norman Robbins, Fort Worth's community relations manager. "For example, the counters at nurses' stations are low to the ground so that the children can see over them, and the built-in medical equipment in the rooms is hidden as much as possible," he said.

Fort Worth also made a major contribution to a fund-raising project for the hospital during construction planning in 1987. About 250 employee volunteers staffed a pre-Christmas toy sale for the project.

GD crew raises \$11,000 in charity boat race

Although they didn't finish, General Dynamics employees who crewed a boat in a recent round-trip charity race from Los Angeles to Honolulu still enjoyed a happy ending. They raised \$11,000 for the Cystic Fibrosis Foundation through employee donations and the company's matching gifts program.

The crew's 40-foot catamaran, the *Cat-Man-Do*, hit a submerged object during the night in high winds and high seas 60-80 miles from Los Angeles on the outboard leg of the race and had to return to port.

"We were on a heat doing almost 11 knots (at the time of the collision)," said Andrew Rose, Valley Systems' associate general counsel who captained the boat. "It would have been a fast run to Honolulu."

Rose, who has a nephew born with cystic fibrosis, estimates that General Dynamics matched about \$3,100 in employee contributions. Valley Systems' Employees Fair Share Club and similar groups at Pomona and Electronics gave \$1,000 each. Convair and Space Systems employee organizations contributed \$2,000.

The Honolulu-bound crew consisted of Rose; Bert Sena, Pomona director of finance; Mark Rahhall, Pomona engineer; Mark Raptis, Convair manufacturing design engineer; Jim Gucwa, former master scheduler at Electronics; and Paul Bressman, a non-General Dynamics employee.

Rose plans to enter next year's race and has room for additional crew. Anyone interested can contact him at (714) 945-7898.

Three Space Systems teams tackle president's Mars, moon programs

Space Systems employees enthusiastically applauded the lunar/Mars initiative set forth by President Bush in his July 20 speech commemorating the 20th anniversary of the Apollo 11 mission moon landing.

Then the scientists and analysts who have been working on advanced NASA programs went back to what they have been doing for a long time: studying how to make that vision a reality.

"Space Systems has formed three task teams in response to the president's initiative," said Howard Bonesteel, director of advanced NASA programs. "Our objective is to support NASA to the fullest extent possible as they prepare their report for the National Space Council at the end of October."

Bush will receive the report, which will include a comprehensive mission description and analysis, a program plan, technology assessment and cost analysis.

Earlier this year, Space Systems was awarded a three-year space transportation infrastructure study by NASA's Marshall Space Flight Center in Huntsville, Ala. The aim is to identify future space transportation systems and new technology to supplement today's space shuttle and expendable launch vehicles. Winning the study made Space Systems a key planner for NASA

and a leader in the lunar/Mars task force.

Eight Space Systems employees who have been working on the infrastructure study in San Diego will join five others in Huntsville. The team will concentrate on transportation aspects of the initiative.

A second team will temporarily relocate to Houston to work with the Johnson Space Center in overall mission planning. The center is the lead NASA center for the overall task force.

A third internal team will evaluate data and study strategy and business opportunities that the redirected space initiative presents General Dynamics. The initiative involves systems through the second decade of the next century.

The three teams will exchange information regularly to keep data consistent and to maximize the overall study effectiveness.

"We want to position ourselves to compete effectively as program definition and future opportunities emerge," Bonesteel said. "While the president's lunar/ Mars initiative opens the door for a great expansion of space programs, the scope of the initiative is so encompassing that potential roles exist within it for many General Dynamics divisions."

Julie Andrews

Fort Worth foursome aids pharaoh fans

Four employees at Fort Worth had a close encounter with ancient Egypt while serving as volunteers for the Ramses exhibit, a traveling collection of 3,000-year-old artifacts. The display ended its U.S. tour in August after a six-month showing in Dallas.

The volunteers spent hundreds of hours giving presentations about Ramses for schools and community groups and serving as guides at the exhibit. The guide service entailed weekly four-hour shifts for three of the volunteers, plus the two-hour round-trip drive each week from their homes to the exhibit site.

The exhibit's 75 ancient artifacts and other displays were seen by more than a million people during the show sponsored by the Dallas Museum of Natural History, said Andy Nygaard, one of the assistants.

Nygaard, a support equipment engineer, was recruited for the project through his involvement with Fort Worth's Toastmasters International organization, as were volunteers Dody Foster of the material department and Harlene Bowers of engineering. Jim Lawler, an engineer on the National Aero-Space Plane program, became involved through his long-standing interest in Egyptology, the study of Egyptian antiquities and culture.

Nygaard spoke to more than 40 groups and Foster to approximately 20 about Ramses. At the exhibit, they introduced a multimedia presentation that provided visitors a glimpse of what life was like in the Nile region in about 1200 B.C.

"As many times as I saw the opening presentation, it still gave me a chill, a feeling of being transported back 3,000 years and being a part of that time," Foster said. "I felt I was part of that history, in addition to being part of the history-making experience of bringing the exhibit to the United States."

The volunteers received four hours of training to prepare them for questions about the exhibit and the 67-year rule of Ramses II as Egypt's pharaoh. Nygaard said his involvement with the exhibit spurred him to do further research on Ramses and Egypt.

The speaking engagements gave Nygaard, Foster and Bowers a chance to sharpen public speaking skills they learned as Toastmasters. The Fort Worth Division has 21 Toastmasters clubs.

Lawler spent about 150 hours helping volunteers who were guides at the exhibit. "I briefed the guides on details about the pieces, such as the hieroglyphics corresponding to hours of the night on a water clock," Lawler said.

A student of Egyptology since the 1950s, Lawler reads hieroglyphics and has written two books on cyclic history, a theory dealing with the rise and fall of civilizations.

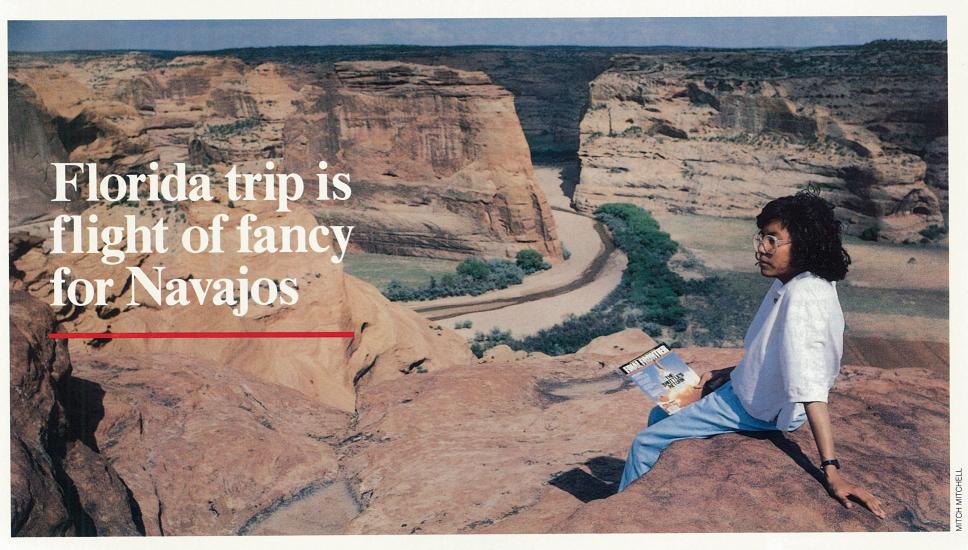
"Through my work in connection with the Ramses show, I feel like I've been able to educate a large number of people — probably thousands — on the subject of Egyptology," Lawler said.

■ Joe Stout



SUBMARINE HONOR ROLL. This sign, displayed prominently outside the Groton, Conn., shipyard identifies the submarines built by Electric Boat. It was updated in 1983 and again this summer. The latest update includes Electric Boat's submarine construction contract for *Seawolf* (SSN-21), the Navy's newest generation of fast attack submarines.

IN VEHDUN



The following story is reprinted from Together, an award-winning booklet published by General Dynamics to highlight the community activities of the company and its employees.

O YOU THINK CHINLE IS BIZARRE?"

It's not the question an out-of-town visitor expects to be asked, particularly by a junior high school student.

But then Chinle, Ariz., does not fit the Norman Rockwell image of small-town America. And the junior high schooler who asked the question is very much aware of it.

Chinle is in the northeast corner of Arizona near the "Four Corners" where Arizona, New Mexico, Utah and Colorado meet. It is also in the heart of the Navajo reservation.

The eighth-grader who posed the question is one of 19 members of Chinle Junior High School's Advanced Learning Lab. In May 1988, the class took a week-long trip to Florida's Kennedy Space Center and Disney World's Epcot Center thanks, in part, to a \$17,000 grant from General Dynamics.

Chinle's dilapidated trailers and small houses, set against the stunning panorama of the reservation's mountains and canyons, must evoke the question in a sensitive youngster. Chinle is no more bizarre than the other villages that dot the expanse of sagebrush and juniper trees. Chinle is poor and beset with economic

and social problems that defy easy or short-term solutions.

The unemployment rate in the Chinle area is about 72 percent, double that of the reservation. There is no industry in the town of about 3,000. The only jobs available are with the Bureau of Indian Affairs or the school district. "Sure, we tell our kids to get an education and then come back to their community," says Isabella Emerson, mother of one of the junior high students. "But what are they going to do when they get back here?"

Navajo leaders and Anglos alike agree that an economic revolution is needed to break the cycle of poverty that grips the Navajo tribe. But they are also asking themselves if economic development can be encouraged without destroying the traditional Navajo way of life. In the minds of Chinle's youngsters, these questions are at the core of their perceptions of themselves, their own society and the world outside the reservation.

In autobiographical sketches and in compositions about their trip to Florida, the 19 kids touch immediately on the special nature of their lives. "We live like regular people," writes one, "except we don't have running water, sanitation or electricity." Another notes,

▲ Audrey Emerson, one of the students who traveled to Florida, sits on a bluff overlooking the Chinle area.

"We live just like anybody else, but sometimes we do Navajo ceremonies for special purposes such as curing sickness or chasing away evil spirits."

The trip to Florida was no ordinary year-end excursion for the students of Chinle's Advanced Learning Lab. Some of them had never been away from the reservation, while for others 1987's visit to a performance of "Fiddler on the Roof" in Albuquerque was the farthest they had been. "Most of our kids are born and raised in the desert, and the desert is all they see," says Dorrean Walker, a Chinle teacher. "We are very interested in teaching the kids by letting them experience things they would otherwise only see on television."

The teachers and administrators at Chinle express the hope that trips such as this one will open up the kids' perceptions and awaken their minds to life beyond the experiences of the 100-mile parameters around Chinle. That hope is most poetically expressed by one student: "My dream has been lit by you and it will always burn. Thank you very much."

The dream to many of these students reaches beyond the dreamer. Writes one: "In the near future, it will be up to some Navajo to do what is best to make life better for every Navajo. I'll be willing to help make life better."

■ George Salamon

Cessna field rep's magic bag mystifies Chinese inspectors

This is a condensation of a story that appeared in the summer 1989 issue of Cessna's Directions magazine. The author is a senior Citation field service engineer based in Munich, Germany.

A few years ago I was assigned by Cessna as the field service engineer assisting the delivery of the first three Citation aircraft to the People's Republic of China.

I realized this delivery would not be easy. The Citations were to be subjected to an exhaustive inspection by the Chinese. I was to assist in any way and correct any deficiencies in the aircraft.

I was concerned about staying alone in China, as I am in any country where I do not have immediate backup from the Cessna customer service, engineering and product support organization. And especially where I don't have ready access to parts.

Before the trip, I gathered items that might be needed during the inspection and teardown, but would not be easily found in China. I packed them in my Jeppesen, the bag I always carry on field service trips.

The formal inspections of the aircraft began in China during a full monsoon. Despite the weather, the Chinese leaped at their new airplanes, parked outside on a ramp but protected by tarps.

I watched the activity, sitting on my upturned Jeppe-

sen case, holding up an umbrella against the downpour and puffing my cigar.

Three technicians approached. "Mr. Lanier, No. 1 airplane is missing the crew screwdriver shown on the delivery list."

I stood, opened my Jeppesen bag, and pulled out one new Citation-approved screwdriver. The technicians looked at one another, thanked me formally, and left.

Several hours later, the same three plus two more technicians came to me with "paint damage on No. 2 and No. 3 airplanes." I opened my Jeppesen and extracted one can each of blue, red and white touch-up paint. Five astonished people looked first at me and then each other before walking away.

The next day, with rain still beating down, the five technicians plus four more—the number seemed to grow with each incident—came to me and asked, "Mr. Lanier, you can obtain Comm HF 220 installation manual?" Once again I stood up, opened my bag, and produced the requested manual.

This went on during 10 days of inspections. It became something of a game between the Chinese technicians and me. Luckily for me, and bewilderingly for them, I came up with everything they asked for.

On the last day, 30 technicians approached me, accom-

panied by 40 or more men, women and children from five neighboring villages. Evidently word had gone around that something akin to miracles was occurring on the airport ramp.

This time, everyone was smiling as if they knew they had finally won the game. I was told, "Mr. Lee has severely damaged a camera pod attach bolt."

I looked at their faces and saw confidence that there could be no replacement part for this anywhere in Asia.

I stood, unsmiling, silent. I lit a new cigar, savoring the tension in the crowd. All eyes were on the Jeppesen bag. I slowly opened it, reached in and pulled out two brand new pod attach bolts, still wrapped in oiled cloth, and handed them to the technicians.

Everyone cheered. The game was over. The rest of the afternoon and evening were devoted to partying the Chinese way.

The next night, the Chinese Academy of Aeronautical Sciences gave a formal dinner at which purchase contracts for the three aircraft were signed. After many toasts and speeches, Fu Gie, head of the Chinese delegation, arose and said, "Now, a special thanks to Cessna field service and customer service."

And he added, "Mr. Lanier, do you have a part number for the Magic Bag?"

Russ Lanier

Parts plant modernization is Sterling job

Rick Gillette, plant manager at the Land Systems Sterling Plant, has found a key to unlock the competitive genie — plant modernization.

"Starting with a thoroughly inadequate manufacturing plant that was poorly designed, too crowded, improperly lighted and totally reliant on technical manuals, Rick implemented a \$6 million modernization program that has increased the efficiency of his opera-

tion dramatically," said Robert F. Schwalm, Land Systems vice president-manufacturing.

Located in Sterling Heights, Mich., the 20-acre plant features the latest in computer technology to help produce electronic and optical components and replacement parts for the M1A1 Abrams tank.

"We had a highly skilled and dedicated work force, laboring under awful conditions," Gillette said. "To create an efficient plant in which the workers could assemble precision, highquality electrical/optical components exclusively, we had to completely renovate the entire factory."

Modernization took the last 2½ years. "One of our major accomplishments," said Richard Kreitz, project leader, "was being able to modernize and renovate the entire facility while maintaining full plant production."

Layout changes required rearranging floor space in all departments and redefining and

improving work flow. New material handling systems were installed, including a sophisticated conveyor system that allows components to be delivered to workstations automatically.

Incoming parts are inspected by equipment that is accurate to within 1/500th of an inch.

A new area was developed for wire harness cutting

operations. The assembly of some electrical boxes involved laborious selection, cutting and marking of numerous wires for harnesses. Now the operator can monitor each wire as the circuit routing and termination is completed. Miswires have been eliminated

In addition, wires are mechanically cut to the proper length, stripped and terminated automatically with the



Electrical assemblers at Land Systems build hull network boxes for the M1A1 tank. Assemblers are (from left) Wanda J. Kosek, Elizabeth J. Carr, Mary A. Mudel, James M. Wheeler, Dorothy M. Mingus and Dolores Floreskul.

correct pin. This procedure, performed manually at a rate of 60 units per hour, is completed at 1,200 units per

To ease storage problems, a mezzanine section was designed. This additional story between the main floor and the roof has doubled storage space.

One of the most unique innovations was creation of

prewire kits that enable one individual to produce kits for two different departments. Kitting provides additional protection to delicate components, improves configuration control by making sure completed kits reflect the latest revision level, identifies quality problems or shortages, and increases productivity. Employees no longer spend up to 14 percent of their production time getting the materials they need to

perform their tasks.

To improve its ability to assemble optical components, the division built a 100,000 class clean room. "It's absolutely critical that there be no airborne contaminants when we assemble the gunner's primary sight," said Gillette. The clean room allows fewer than 100,000 particles of .5 microns or larger contaminants per cubic foot of air. A particle of .5 microns is 40 times smaller than the diameter of a human hair.

To align the optics in the gunner's primary sight, a new relay alignment subassembly fixture was designed. The previous manual alignment took about two hours per sight. The new process takes 10 to 15 minutes.

A total of 225 new workstations was designed and a personal computer was placed at each, eliminating technical manuals and creating a paperless environment. All of the software for this project was developed internally by Sterling

engineers.

The improvements help employees work more efficiently while building higher quality products. "The Sterling modernization has increased productivity, improved quality and reduced costs," Gillette said.

■ Don Gilleland

Statistical process control = Pomona quality

TQM, SPC and JIT read like alphabet soup, but they're the recipe for improved quality at Pomona Division.

Statistical process control, or SPC, is used in many manufacturing processes at Pomona. It helps analyze specific dimensions on parts of a piece of hardware to determine if it meets specification.

"SPC has been around for years," said Jack Brady, Pomona's director of fabrication. He described it as a system that monitors a process or operation. By comparing the activity to an established set of criteria, it identifies variations that can be corrected immediately.

In most manufacturing lines, after a job is completed its finished parts are inspected at a "tollgate." If the inspection finds flaws, the part is sent back for rework, along with any suspect parts coming off the same line.

Pomona took statistical process control a step further. "After extensive study, we decided to apply it to an entire line rather than just a section of one or two parts," Brady said. The first line to use the new process, the Standard Missile center support line, has fulfilled

Operators all along the line enter data on each part into an electronic portable data collector. Instant feedback indicates any discrepancy so a correction can be made immediately.

"The center support line is an incredibly complex section of the missile hardware and it must meet extremely close tolerances," said line supervisor Charlie Villaloboz. "The computer picks up the difference between good and bad hardware. It's a great tool and allows us to take responsibility for our own work."

Besides eliminating costly rework, quality has gone up. "Our quality control sections and our customer were in on the process from the beginning," said Cleve Holifield, manager of quality improvement programs.

Brady said that many people deserve recognition for designing and implementing the SPC system, but he credits the program's success to the division's commitment to total quality management, or TQM.

"We started out by setting up a team of manufacturing, quality control, engineering and our Navy customer to analyze our current process," he said. The team studied one section of the machine shop, the Standard Missile center support line. Working with individual machine operators, the team analyzed the data and set up the statistical process control standards against which the work would be compared. The computer programs were prepared using those standards. Finally, each team member worked with his respective department to adjust policies and practices to implement the

The results have been better than expected. "We've gotten measurable paybacks," Holifield said, "in major cost savings through reducing work and repairs. Also, we have had zero scrap for the last 18 months and the process is providing us with an excellent quality product. For instance, in July, defects were less than five parts per million. Finally, we decreased product flow time and enabled a 'just-in-time,' or JIT, production control scheduling program to be put in place."

The division is expanding the process to other lines.

■ Eric Solander

Fort Worth starts SPC for suppliers

Fort Worth is sharing its successful statistical process control with F-16 subcontractors.

The Supplier SPC Program is a joint effort of procurement quality assurance and the material department. It encourages subcontractors to use SPC.

The supplier incorporates SPC in two phases. In the first phase, the company sets up a documented system and has at least one SPC application in place to test the system's validity. "After the system is documented and proofed, a control plan is drawn up for processes and parts, with the ultimate goal of SPC-certified parts and a reduction of inspection," Peggy Lucht-Rixie, supplier SPC coordinator, explained.

Ten of Fort Worth's suppliers have completed the first-phase requirements, according to Lucht-Rixie.

Fort Worth sponsors several workshops annually to train suppliers in SPC. The division also publishes a supplier SPC bulletin to promote the workshops and share information.

"Within the division, SPC is currently being used in such diverse applications as the conventional and numerical control machine shops, the panel harness department, the paint shop and sealant area, composites and tube bending," said Chris Sheidler, Fort Worth's SPC coordinator.

The SPC program has proven its effectiveness at the division's Electronic Manufacturing Center. "The Electronic Manufacturing Center has had an SPC group for more than a year and has incorporated statistical methods in 17 production processes," said Robert D. Davis, SPC coordinator for the center. "For one critical process employing SPC, the wave solder process, the defect rate has been reduced from an average of 7,500 defective solder joints per million to about 1,250 per million."

Company helps telethon triple donations

General Dynamics played an important role recently in the success of the Leukemia Society's "Six Hours for Life Televent" that raised \$295,500 in the St. Louis segment of the program. The amount was more than three times the 1988 total.

B. Edward Ewing, vice president-operations, was chairman of this year's St. Louis portion of the event. He served as master of ceremonies. In addition, 17 employees volunteered to take telephone pledges.

"I am extremely proud of the effort our employees put into the project," Ewing said. "It is a worthwhile cause and we were very pleased with the results."

All donations went to research of leukemia, which will strike an estimated 70,000 people in the next year. The national telethon raised \$5.1 million. Chairman and Chief Executive Officer Stanley C. Pace presented a check from the company for \$25,000.

"The success behind our successful televent was Ed

Ewing," said Lynda Ginsparg, assistant executive director for the St. Louis Gateway Chapter of the Leukemia Society of America, Inc. "He was extremely dynamic, persuasive and dedicated."

The televent was the culmination of a year's effort by Ewing, whose daughter is the 1989 St. Louis poster child. Ewing and his daughter appeared with Steve Allen and Jayne Meadows in a segment that was videotaped in Los Angeles and was televised during the national segment of the telethon.

"Mr. Pace also gave us support that we had never received from corporations," Ginsparg said. "He sent requests to other executives of corporations and the response was wonderful. It was extremely generous of him to go out of his way for us.

"We owe a lot of thanks to General Dynamics."

■ Myron Holtzman

Quality is elementary with students

How do you spell "quality?" The students at Pleasant Valley Elementary School in Groton, Conn., spell it: K-O-A-L-A-T-Y. Koalaty has a special meaning for these children. In fact, it has become a way of life for

George P. Sylvia, senior auditor in the quality system and performance department at Electric Boat, is active in spreading the word of "quality" at Pleasant Valley School. "Koalaty introduces the importance of quality at the early stages of a person's development," Sylvia said. "You're never too young or too old to gain a better understanding of quality. Children need to commit themselves to quality in their work—striving to do it right the first time."

Sylvia, an employee in Electric Boat's quality organization since 1958, is a member of the American Society for Quality Control. The Koalaty Kids program began with the help of the society's Thames Valley Section and Pleasant Valley's teachers.

KOALATY is an acronym for the students' and the teachers' beliefs and values: K for Koalaty; O for opportunity; A for awareness; L for learning; A for achieve; T for terrific; and Y for you and me.

The Koalaty Kids program starts at the elementary level, training and educating our nation's future leaders. "Instilling the most basic principles of quality in an effort to groom boys and girls to develop into productive adults is really at the foundation of this program," Sylvia said.

The program also promotes literacy. "There are some basic requirements to becoming a K-Kid, including reading a minimum of four books a month," said Paul Bednarz, a sixth-grade teacher and leader of the Pleasant Valley Koalaty Kids program.

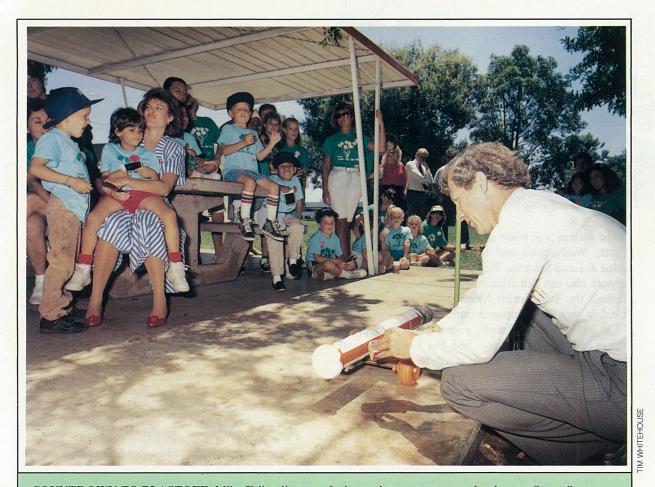
"The kids at this school are really eating this program up," Bednarz continued. "There's a mirror in the main hall, with a sign above that identifies the person looking into the mirror as a K-Kid. The students love stopping to glance at themselves as they pass down the hall."

The program, carrying the message of "first time quality" in all that a person does, is part of the school's curriculum. When working on an assignment, the students are encouraged to search for and correct their mistakes. Each month, the K-Kids are recognized for their achievements with awards such as pencils, erasers, T-shirts and certificates. Often the school presents the awards at a rally featuring skits and singing by the students.

Koalaty Kids is intended to be built upon each year. For example, students' achievements in the K-Kid reading program are carried over to the following academic

"One of the results of the program is an increase in the number of books being read, as well as a marked rise in the students' enthusiasm and self-esteem," said Raymond Fanning, Pleasant Valley principal. "They just smile from ear to ear like Cheshire cats!"

■ Donald P. Blanchette



COUNTDOWN TO BLASTOFF. Mike Felix, director of advanced space systems technology at Space Systems, is about to demonstrate rocket propulsion by lighting a "rocket" made of cans, bottles and toy wheels for American Cancer Society campers at Convair Recreation Association's Missile Park in San Diego. Space Systems sponsored a day at the park for 45 children ages 4 to 8 who are in various stages of cancer treatment. The campers learned about missions to the moon and Mars, viewed a demonstration of cryogenics and saw an Atlas rocket.

New program trains buyers to maximize company discounts

Some of the company's key purchasing people recently began training to work on the corporate material agreement program.

The program is based on the principle that commodities purchased at more than one General Dynamics location should be bought on a corporatewide basis to realize higher volume discounts and eliminate duplicate administrative costs.

Dave Pooler, corporate material agreement director, instituted the training program to help division-based coordinators who negotiate purchases. The first two participants, Toni Remor of Electric Boat and Steve Reese of Electronics, attended the one-week program in St. Louis in July. They worked with various directors and vice presidents in the operations organization and combined on several projects developed by Pooler to enhance their purchasing skills.

The corporate material agreement program, which began in 1959, saved \$33 million for the company in 1988 on purchases of \$271 million. Some contracts allow employees to save on personal purchases of such items as computers, car rentals and eyeglasses.

Anyone wanting more information on the program or who has ideas for new items to be included should contact a local corporate material agreement coordi-

ABILENE
Paul Gradowski
CAMDEN
Janice Pratt
CE <u>SS</u> NA
John Rice (316) 946-6687
CONVAIR Jan Eldridge
DATA SYSTEMS Dawn Ellen
Dawn Ellen (314) 851-8985
ELECTRONICS
Steve Reese
ELECTRIC BOAT Toni Remor
FORT WORTH Dennis Modisett (817) 762-1765
LAND SYSTEMS
Sherryl Love
MATERIAL SERVICE
Keith Wojtas (312) 443-6825
POMONA
Chuck Liesenfelt
SPACE SYSTEMS Tom McBride
VALLEY SYSTEMS Teresa Schmitz
Teresa Schmitz (714) 945-6827

Now hear this: Photo contest entries limited to one per employee

Since the announcement of a companywide employee photo contest in the August issue of General Dynamics World, the most often asked question has been:

"How many photos can I enter?"

The answer: one.

Deadline for entries — one per person — is Nov. 1. Twelve first-place winners will each receive a \$200 savings bond and up to 36 honorable mentions will each be given a \$100 savings bond. The photos will grace a 1990 company calendar that will be inserted in General Dynamics World.

Photos may be black and white or color, of any subject, and must have been taken since June 1988. Entries must be 8x10 prints and negatives must be available upon request. No special darkroom effects are

All full-time employees, except General Dynamics professional photographers, are eligible. Send the entry with your name, employee number, division and day/ night numbers to Contest, Public Affairs Office, General Dynamics Corp., Pierre Laclede Center, St. Louis, MO 63105. Anyone wanting an entry returned should enclose a self-addressed 8x10 envelope. Call (314) 889-8564 or 8566 for more details.



F-16 Fighting Falcons operated by the Air National Guard at Syracuse, N.Y., have been equipped with 30mm anti-armor gun pods through an effort that the Air Force has called a classic example of teamwork.

Fort Worth, the Abilene Facility and the Air Force's F-16 Program Office at Wright-Patterson Air Force Base, Ohio, all played important roles in the project, as did General Electric, manufacturer of the gun.

The result: The New York Air National Guard has the first F-16 squadron with the dedicated mission of close air support of ground forces.

In August 1988, the Air Force directed that 20 F-16A/B aircraft being assigned to the 174th Tactical Fighter Wing at Syracuse be equipped with 30mm guns. An accelerated schedule completed the modifications in June at a significant savings under Air Force estimates.

"The integration included designing and producing a production pylon for mounting the gun pod, and designing and installing a wiring modification that allows the pilot to fire the gun with the existing trigger (on the F-16's side-stick controller)," said John Baker, Fort Worth's assistant project engineer for weapons integration.

Fort Worth engineers used data provided by General Electric to design and develop the modification and

pylon, which were flight tested with F-16s at Eglin Air Force Base, Fla. "The pod is a fairly heavy weapon, and the 30mm cannon produces a considerable amount of blast and recoil," Baker said. "The tests verified our calculations for the effects of stress, vibration and inertia."

Abilene became involved in 1988 when the facility produced four prototype pylon assemblies for F-16 close air support flight demonstrations. The pylons are used to attach the GPU-5/A gun pod, an existing weapon in the Air Force inventory, to the F-16's centerline fuselage hard points.

The close air support demonstrations were conducted at Nellis Air Force Base, Nev., and Fort Hood, Texas, using F-16Cs and Fort Worth's technology demonstration aircraft, F-16B No. 2.

Following the successful flights, Abilene produced 25 additional assemblies of the 21-part pylon for the Syracuse unit. The first production pylon was completed ahead of schedule in March. All had been shipped to Hancock Field in Syracuse by May, one month ahead of schedule.

The 30mm guns have four barrels and are capable of firing 2,400 rounds a minute. The F-16s retain their internal 20mm guns, which are bypassed by the air-

▲ An F-16A flies with a 30mm gun pod attached to its centerline stores station. The 30mm gun is a standard Air Force weapon for close air support of ground forces.

craft's gun control circuit when the pod is selected. The pilot also has the option to select the 20mm cannon.

The Syracuse unit is the first where F-16s have replaced A-10 Thunderbolt aircraft. The Air Force is considering the F-16 as the primary option for the eventual replacement of all its close air support A-10s.

Maj. Bill Potter, chief of F-16 derivative projects at Wright-Patterson, praised the effort. "Our success was largely due to the direction we received and the team spirit by all involved, including contractors and participating Air Force organizations," he said.

Potter commemorated the program's completion by presenting plaques to Charla Wise, Fort Worth's director of Block 40 F-16 programs and manager of the 30mm gun pod integration, and to the Abilene Facility, represented by manufacturing operations director Larry Goza.

The plaques credit the General Dynamics team for having the "quickest draw (design) in the west" and depict several broken records with an unbroken piggy bank.

■ Joe Stout

Company network makes videoconferencing a reality



AUL BRADBURN HAD planned a series of meetings to discuss resources needed at the various General Dynamics divisions. The venture could have been a time-consuming, costly expedition with corporate officials traveling to the various division sites. However, neither Bradburn nor any other General Dynamics employee had to make a single trip.

"Normally, several people from the Corporate Office would have hopped into a plane to review what resources might be needed," said Bradburn, director-corporate planning. "That's all changed now."

The reason is the new General Dynamics Videoconferencing Network that allows communication by sight and sound. The network opened without a hitch, linking three locations in a conference July 31. The system has been installed at five sites and provides several major benefits: It speeds information flow, expedites problem resolution, increases the decision-making base and reduces nonproductive travel time and expenses.

Graphic material — photos, charts or graphs — also can be shared. However, government classified information cannot be communicated.

The system is in place at San Diego, Pomona, Fort Worth, Washington and St. Louis. Rooms may be added at Land Systems, Electric Boat and Cessna. The network also can join other videoconferencing networks through the U.S. Sprint Meeting Channel, which is linked to over 100 companies nationwide.

The initial videoconference, a second source mapping session between San Diego and the Corporate and Washington offices, was conducted by Ray Lubeck, marketing director for the project at Convair. Don Kissler, corporate network systems engineer manager, was on hand to make sure the technical end held up.

Many company officials attended the debut, including Chairman and Chief Executive Officer Stan Pace, President and Chief Operating Officer Herb Rogers, Executive Vice President-Missiles and Electronics Ralph Hawes and Vice President-Program Development Dave Wheaton. Hawes and Wheaton were instrumental in the videoconferencing program.

"During the meeting, it felt like we were in the same room," Bradburn said. "That's how intimate it seemed. When the camera zoomed in on the speaker it was as ■ Don Kissler (standing) explains the videoconferencing network while Jeff Gilfillan (seated, far left) monitors equipment. Others seated (from left) are Russ Meyer, Ralph Hawes, Stan Pace, Herb Rogers and Jim Mellor.

though he was sitting across the table from me. You have the facial expressions and the visualization of any emphatic gestures. I was extremely surprised and impressed at the quality.

"This will fundamentally affect the way we do business. Sometimes it took a couple of days just to hold a three-hour meeting because of the travel involved. Now, after doing the planning and logistics, the rest takes only the time to hold the meeting. The only thing missing is the small talk in the hallway."

Said Robert L. Gallo, corporate director-facilities: "We did what we set out to do, which is good considering the complexity of the network. For example, this network consists of all communications technology, such as microwave, satellite, fiber, infrared and metallic wire."

Gallo said the project went smoothly from the time construction began in March.

"The team worked very hard to achieve an on-time delivery and we did it under the budget set out for the program by many thousands of dollars," Gallo said. "That was due to some astute management of the facilities and data systems people who really understood the specifications and worked very closely with the vendors.

"But the network requires that employees be aware of the videoconferencing capability and its benefits. And it may require the employee change slightly the manner in which he approaches briefings."

As users adjust to looking into the camera and having a view graph that is transmitted by the operator, the system will feel more natural. In addition, individuals not in the network can participate in the audio portion by dialing into the conference.

Myron Holtzman

Anders named vice chairman; will succeed Pace

ILLIAM A. ANDERS will join the company on Jan. 1 as vice chairman and will become chairman and chief executive officer on Jan. 1, 1991, current Chairman and Chief Executive Officer Stanley C. Pace announced on Sept. 27.

Pace had previously announced his intention to retire at the end of next year.

Anders, 55, is senior executive vice president-operations and a director of Textron Inc., Providence, R.I.

A 1955 graduate of the U.S. Naval Academy, Anders was an Air Force pilot until 1963 when he was selected by NASA as an astronaut for the manned spacecraft program. He was one of three crew members aboard the 1968 Apollo 8 lunar mission and served as backup pilot for Apollo 11, the first lunar landing. From 1969 to 1973 he was executive secretary of the National Aeronautics and Space Council in Washington.

Anders became commissioner of the Atomic Energy Commission in 1973 and he became chairman of the Nuclear Regulatory Commission when the AEC was so renamed in 1975. From 1976 to 1977 he was U.S. ambassador to Norway.

He joined General Electric Co. in 1977 as vice president and general manager of the Nuclear Energy Products Division, becoming vice president and general manager of the Aircraft Equipment Division in 1980. In 1984 he left GE to join Textron as executive vice president-aerospace, moving to his most recent position in 1986.

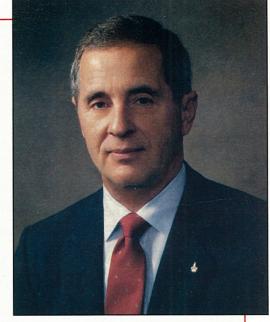
Anders will be elected to the Board of Directors when he joins the company as vice chairman in January. Pace, who has been chairman and CEO since Jan. 1, 1986, said that Anders' military, government and industry background "represents an ideal fit with the company's management style and philosophies, and

many of its key government production programs."

Pace said: "We consider ourselves fortunate to have Bill Anders prepared to take the helm as we move into some very challenging years for the industry. This is a solid and well-positioned company and I expect him to provide the kind of leadership for our 100,000 employees that will keep us out in front. We're extremely happy to have him."

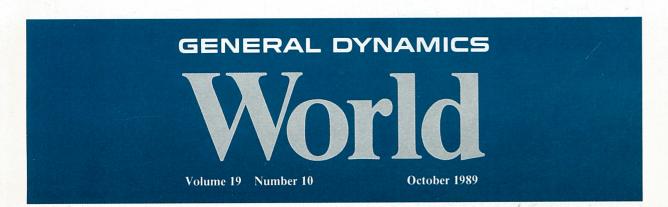
The recipient of the Wright, Collier, Goddard and Arnold flight awards, Anders received an advanced degree in 1963 from the Air Force Institute of Technology at Wright-Patterson Air Force Base, Ohio. A retired major general in the Air Force Reserve, he holds five world flight records.

A resident of Barrington, R.I., Anders and his wife, the former Valerie E. Hoard, will relocate to St. Louis. The couple has six children.



William A. Anders

- 55 years old (56 on Oct. 17)
- Senior executive vice president-operations, Textron Inc.
- Graduate, U.S. Naval Academy
- Apollo astronaut
- Former chairman, Nuclear Regulatory Commission
- Former U.S. ambassador to Norway





Atlas/Centaur launch last of NASA era

HE SUCCESSFUL LAUNCH of Atlas/Centaur-68 last month marked the end of an era of launches for NASA and signaled the transition of Space Systems Division's Atlas family of launch vehicles to commercial operations.

With barely a minute to spare in the 45-minute launch window, Atlas/Centaur thundered into the central Florida skies before dawn Sept. 25 with the last in a series of Navy Fleet Satellite Communications spacecraft. Nearly 28 minutes after liftoff from Space Launch Complex 36B at Cape Canaveral Air Force Station, the satellite separated from the Centaur upper stage on

schedule, sending the spacecraft into a 19,324 nautical mile transfer orbit.

For the first time, Space Systems Division served as the launch director for an Atlas/Centaur mission and was responsible for planning the range services requirements. These were roles formerly carried out by NASA. The company was also responsible for the performance of the entire contractor team and, as such, served as the systems integrator for the AC-68 launch.

Over the past 11 years Atlas/Centaur has boosted six Fleet Satellite Communications craft into orbit.

New division puts training programs on track for GD

EIL R. ANDERSON, who has flown more than 200 different aircraft, will soon have a chance to use his expertise to help train the nation's young military pilots.

Anderson, one of the original F-16 test pilots and most recently director of international market development at Fort Worth, was named division vice president and general manager of General Dynamics' new Flight Training Systems Division, which will seek contracts to train military aircrews.

The division will be based in Wichita, Kan., and will employ about 50 people. Many of them are already in place on the Tanker Transport Training System (TTTS) proposal team at General Dynamics' Cessna Aircraft Co. subsidiary in Wichita. The Flight Training Systems Division will be operational in early October.

Anderson will report directly to Russell W. Meyer Jr., executive vice president of General Dynamics and chairman at Cessna.

"This is the first time the corporation has consolidated all its aircrew training programs and resources under one roof," said Anderson. "This will be a coordinated effort to capture programs like TTTS, which could be worth \$1.5 billion for 211 aircraft and the associated training equipment, software and support."

Stanley C. Pace, General Dynamics chairman and chief executive officer, said the new division "will be responsive to the Air Force and Navy's flight training requirements and reflects the company's long-term interest in flight training systems as a product/service line."

Pace said the new division is aimed at all U.S. aircrew training, but its immediate concern will be the Tanker Transport Training System. He said the division will furnish an integrated training system and will draw on the expertise and existing resources of Cessna, General Dynamics' Fort Worth Division and CAE-Link. The trainer aircraft proposed will be a Cessna Citation derivative of the T-47A used for undergraduate flight officer training by the Navy.

The major training device in the ground-based part of the training system, the operational flight simulator, will be proposed as a derivative of the Cessna Citation simulator used in the commercial training of business jet pilots. System components will be provided by Link Training Services, Link Flight Simulation and the Allen Corp., a CAE-Link subsidiary responsible for analysis and development of the overall instructional program.

Pace said the Flight Training Systems Division will (Continued on Page 3)

B-24 returns to Convair

CONSOLIDATED B-24J Liberator landed at Lindbergh Field in San Diego Sept. 21 in a symbolic reversal of a giant manufacturing effort in World War II.

The B-24J, named "All American," was a nostalgic symbol of the 9,760 Liberators rolled out of the Consolidated Vultee (Convair) plants in San Diego and Fort Worth from 1939 through 1944.

All American, which was restored to flying status by the non-profit Collings Foundation of Stow, Mass., after not flying for 20 years, was brought to San Diego for the 50th Anniversary Celebration of the First Flight of the B-24 Liberator. The event was sponsored by the International B-24 Liberator Club and San Diego Aerospace Museum.

More than 700 enthusiastic Convair workers, members and guests of the club and news media representatives were on hand to greet the B-24 in the Convair flight operations area. Hundreds of Convair employees also watched from the tops of nearby Convair buildings.

The B-24 completed a four-day trip from Kissimmee, Fla., where it had been undergoing restoration for the past two years. General Dynamics is a major corporate sponsor of the restoration project.

The pilot on the transcontinental ferry flight was Bill Bryan of Daytona Beach, Fla. The co-pilot was Tom Reilly, head of Tom Reilly Vintage Aircraft, Inc., of Kissimmee, which restored the B-24 for the Collings

Foundation.

KEN SCHNOCKER

Chairman and Chief Executive Officer Stanley C. Pace (left) greets Convair retiree Les Boring. Boring worked on the B-24 assembly line.

All American made overnight stops at Baton Rouge, La., Longview, Texas, and Tucson, Ariz., and a final intermediate stop at Palm Springs, Calif., where it picked up Chairman and Chief **Executive Officer** Stanley C. Pace, who flew the plane part of the 80-mile final leg.

Pace was a U.S. Army Air Forces captain and B-24 flight leader in World War II. His plane was shot down over Friedrichshafen, Germany, on Aug. 3, 1944, on his 39th mission. He spent the remainder of the war first in a Luftwaffe hospital and then in a German prisoner of war camp.

The flight from Palm Springs took an hour and a half. Film of Pace flying the plane for 30 minutes was taken aboard the B-24 by Chuck DeMund, corporate director-advertising and promotion, who coordinated General Dynamics' participation in the B-24's restoration and San Diego visit.

All American arrived on schedule at Convair's flight operations area. It came into view at the crowd's left, made a low pass and landed at exactly 10 a.m.

The first speaker in a brief ceremony was John E. McSweeny, vice president and Convair general manager. He referred to Consolidated's slogan in World War II, coined by founder Maj. Reuben H. Fleet, that "Nothing short of right is right." McSweeny then said that the B-24 "was the right plane, at the right time and built right" by Consolidated Vultee employees, a few of whom are still with the company.

McSweeny introduced Pace, who said:

"It was a great thrill to once again fly a B-24. For decades I had assumed that I had flown a B-24 for the last time. This brought back a lot of memories."

Pace said the flight from Palm Springs was calm, yet exciting. "There were no opposing fighters or ack-ack (anti-aircraft fire) and it was more pleasant than some of my other flights," he said.

Robert F. Collings, head of the Collings Foundation, told the crowd that the airplane is the only fully restored and flying B-24 in the world and that it will fly in air shows and other events because "we want people to see it, to smell it and to touch it."

After the ceremony, Pace commented that he got the feel of the wartime plane immediately after taking over the controls. "There were no problems, it flew exactly the same, just like in the old days 45 years ago," Pace said. "I would be happy to fly it again."

Among the hundreds of veteran unofficial B-24 experts in the crowd, many of whom had tears in their

eyes, was Les Boring of Claremont, Calif., who retired from the Pomona Division seven years ago after 42 years with the company. Boring said in World War II he ran the 39th station of the 56-station San Diego assembly line where the B-24's wheels, brakes, self-sealing fuel cells and hydraulics were duced

installed.

"This brings back memories of 50 years ago," Boring said. "All of the people I have talked to at the reunion feel that we did do something to make the world a better place to live in.

"It is a thrill to be here because the B-24 was a meaningful part of my life."

All American was left on display at the Convair plant for employees, retirees and club members Sept. 21 and 22, and then was moved to a more accessible part of the airport for viewing by the general public for the following two days.

The B-24 was scheduled to fly on to Carswell Air Force Base in Texas for an event there and then to Colorado Springs, Colo., to fly over the Air Force Academy's stadium during the Notre Dame-Air Force football game Oct. 14.

The Liberator was the most produced military airplane in U.S. history. Counting the aircraft built by

Consolidated Vultee and by three other companies, the total was 18,479. Of these, 18,188 Liberators were combat aircraft (B-24, LB-30, PB4Y-1, Liberator I and II), 286 were built exclusively as transports (C-87), and five were produced solely as trainers (AT-22).

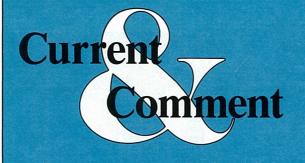
Collings said the restoration involved complete disassembly of the plane and work on about 80 percent of the B-24's 1.2 million parts, mostly because of corrosion and some minor damage.

* CONSOLIDATED * CONSOLIDATED

Collings estimated that more than 90,000 man-hours and \$1 million were expended in the restoration. "If you consider the volunteer work and donated parts and materials, the cost would have been about \$1.4 million," Collings said. "This has probably been the most extensive antique airplane restoration in history.

"About one-third of the restoration cost has been contributed by 27 corporate and 1,500 individual donations and the rest by significant loans by the foundation. Hopefully, now that many more people can see the aircraft, their contributions will pay off the loans."

Contributions to offset the costs of the restoration and to keep the B-24 flying may be sent to the Collings Foundation, River Hill Farm, Stow, Mass., 01775, telephone (508) 568-8924.



ALMOST EVERYONE OVER 50 has some memory of World War II. Gas, sugar, meat and butter rationing. Scrap metal drives. Victory gardens. Savings Stamps and War Bonds. And for those who lost a family member or friend, remembrances that are much more lasting, personal and painful.

Such memories return as the world looks back at the Nazi invasion of Poland in the autumn of 1939, exactly 50 years ago. For America, it was a time of coming to terms with itself, a time of accepting what couldn't be ignored. And during those same days that Hitler's troops were splintering border barricades and driving on Warsaw, the American defense industry was arriving on the scene.

In San Diego, the first of nearly 10,000 B-24 Liberators that would be built by Consolidated Vultee was being prepared for her maiden flight. Designed and constructed at the urging of Maj. Gen. Hap Arnold earlier that same year, the XB-24 showed the world what the American infant aerospace industry could do when the heat was on. The company, later to become GD's Convair Division, ultimately built 6,700 Liberators in San Diego and more than 3,000 at Fort Worth.

Meanwhile, on the other side of the country, the

hiring signs were going up at Electric Boat Co. where, at the height of the war, one submarine would be launched every two weeks, some in late night or predawn hours to catch the turn of the tide and make way for new construction.

If you spent the war years in America you were lucky. In Britain, some 100,000 civilians perished; in France, 450,000. And in the Soviet Union, 7.5 million civilians died — as many as Soviet military. But on continental America, the only known civilian fatalities were a minister's wife and five children who died 46 years ago this month during an outing at Oregon's Mt. Gearhart when a grounded Japanese "balloon bomb" exploded at their feet.

Most people on the home front were unaware of these Japanese incursions, launched on high-altitude air currents across the Pacific. More than 300 reached North America, a few going as far as Kansas and Iowa. On the East Coast, the German U-Boat *Innsbruck* unloaded a four-man saboteur squad off Long Island in mid-1942. Their mission was to destroy aluminum plants, railroads and locks on the Ohio River. Two weeks later, after a bungled foray that included being intercepted on the beach by the Coast Guard while changing their clothes and a dinner ordered in German at Dinty Moore's in New York, the saboteurs — and four others sub-smuggled to the Florida coast — were in FBI hands.

These days, America isn't saving its bacon grease for ammunition or sacrificing silk stockings for parachutes, but it's still turning out top-of-the-line products that keep the flag flying. And 50 years after an Austrian corporal tried to short-circuit sanity and humanity, it's worth remembering that the Free World will always need a front line of defense. And everyone who works in this business is a part of that line—and can be very proud of it. ... PKC

SSIP info will be a phone call away

BEGINNING JAN. 2, employees in the Savings and Stock Investment Plan can call a computerized system named DIAL—for Direct Information Access Line—to conduct transactions and find information.

DIAL will have a voice response system using toll-free 800 call-in numbers providing computerized account information. It will allow account transactions to be generated, audited and processed electronically. It also will provide connections to trained DIAL personnel for employee transactions or inquiries that cannot be handled by the computerized voice response system.

"Through this centralized system, SSIP members will have easy, fast and confidential access to their latest account balances and other savings plan information merely by using the phone," said John C. Palazzolo, corporate manager-employee benefits, SSIP and government reporting.

"More than 80,000 employees have SSIP accounts.

The resources needed to administer such a large number of accounts are staggering," Palazzolo said. "The new system will make it much easier.

"By calling DIAL through a toll-free number and using a personal identification number, an SSIP member can make account inquiries and changes to current savings amounts and investment choices.

"For other matters that cannot be handled by the voice response system, callers will be referred to a DIAL account representative," Palazzolo said.

The computerized voice response system will operate from 5 a.m. to midnight Central Standard Time Monday through Saturday. DIAL account representatives will be available from 9 a.m. to 9 p.m. (CST) Monday through Friday.

DIAL was announced in a letter from Arch H. Rambeau, corporate vice president-human resources. A follow-up mailing in November will give more detailed information.

■ Ed Williams

Company joins other businesses to pursue 10 key technologies

HE AEROSPACE Industries Association has initiated a national cooperative effort among industry, government and academia to advance technologies of the U.S. aerospace industry into the 21st century.

The aerospace industry has always been a leader in high technology and has generally invested more than other industries in research and development. But for the industry to remain a leader, the association decided to emphasize 10 technologies thought most important over the next decade.

The association's Key Technologies Steering Group defined the criteria for selecting key technologies. All candidate technologies were to exhibit the broadest possible application and the clearest potential to improve the position of U.S. competitiveness in civil and military products by the year 2000. The key technologies represent the consensus of the association's member companies and the industry's best technical judgment.

In an address to the Senate Committee on Banking, Housing and Urban Affairs, General Dynamics Chairman and Chief Executive Officer Stanley C. Pace endorsed what he called "this cooperative and pragmatic attempt to muster the combined forces in industry, academic and government laboratories toward a national technology development effort. At the same time, I would like to re-emphasize my strong belief that we should never neglect the critical importance of the aerospace industry's independent research and development programs."

The vehicle through which the key technologies for the 1990s program will be coordinated nationwide is the recently established National Center for Advanced Technologies.

The purposes of the center are to:

- Provide a focal point for coordinating the scientific research and development of advanced technologies.
- Sponsor or support scientific research in advanced technologies.
- Collect and distribute information about research and development of advanced technologies.
- Promote a better understanding and appreciation of the importance of advanced technologies.

 Analyze and improve public policy for advanced technology development as the policy affects university, industrial and government research.

General Dynamics is heavily involved in nearly all of these technologies:

- Electric Boat, Fort Worth, Convair and Space Systems have research, development and production programs utilizing advanced composite materials.
- All divisions are applying artificial intelligence to their products.
- General Dynamics is a member of the Software Producibility Consortium, a 13-company group whose objective is to improve software development tenfold.

Ten key technologies

- 1. Advanced composite materials
- 2. Advanced sensors
- 3. Airbreathing propulsion
- 4. Artificial intelligence
- 5. Optical information processing
- 6. Rocket propulsion
- 7. Software development
- 8. Superconductivity
- 9. Ultrareliable electronic systems
- 10. Very large scale integrated circuits
- The Energy Group at Space Systems has been building superconducting magnets for 12 years and leads a corporatewide working group addressing superconducting applications in all divisions.
- The development of advanced sensors is key to most of General Dynamics' products. Land Systems, Pomona, Convair and Valley Systems are heavily engaged in sensor development.
- The sensors and other subsystems are increasingly using very large scale integrated circuits. Some of the sensors will optically process information; Valley Systems has advanced significantly in optical processing.

New division

(Continued from Page 1)

respond to the Air Force's Tanker Transport Training System request for proposal received on Aug. 29. Several firms are expected to vie for the contract.

Besides competing for that contract, the division will also address future programs such as the Joint Primary Aircraft Training Systems, which will replace the Air Force's T-37 trainer and the Navy's T-34 trainer, and Bomber Fighter Training Systems, which will replace the Air Force's T-38 trainer.

"It's a challenge to set up a new organization and a challenge to increase the efficiency of the current base of training operations," said Anderson. "I'm looking forward to this not only because it's a challenge, but because I think I might be able to contribute something to that efficiency."

A former U.S. Marine Corps fighter pilot, Anderson has held a variety of engineering and flight test management positions since 1964, including chief test pilot of the F-16 Fighting Falcon. A native of Omaha, Neb., he received his bachelor's degree in aeronautical engineering from St. Louis University and in 1982 received that school's outstanding alumnus award.

Anderson first flew the YF-16 in February 1974 with continuous project test experience through 1984. He has demonstrated the F-16 in more than a dozen countries, including at the Paris and Farnborough air shows.



TUCKED IN BY TUGS. Tugboats move the Electric Boat-built *Pennsylvania* to the Naval Underwater Systems Center on the Thames River in Connecticut for commissioning ceremonies Sept. 9. The *Pennsylvania* is one of 10 Trident-class missile-firing submarines in the fleet, all built by Electric Boat.

News Briefs

Charleston Facility heavily damaged by Hurricane Hugo

Electric Boat Division's Charleston (S.C.) Facility suffered extensive damage when Hurricane Hugo hit during the night of Sept. 21-22.

There were no injuries to any employees.

A tornado associated with the hurricane destroyed a small pumping building, much of the training building, the walls and partitions in one end of the administration building, and the doors in all but one building; tore a large portion of the roof from the administration building; and ripped large areas of roofing and siding and one 175-foot door from the final assembly building.

General Dynamics organized several relief efforts for hurricane victims. The Corporate Office contributed \$25,000 to the Red Cross in Charleston. Electric Boat opened a financial relief fund, collected and shipped food and clothing, provided water, gasoline and ice, and loaned 50 employees for damage cleanup. Pomona Division gathered food and clothing and donated money to aid victims in Puerto Rico, which was also devastated by the hurricane. Pomona has a subcontractor based in Puerto Rico.

0 0 0

Valley Systems validated

After three years of effort by several hundred employees, Valley Systems has received its second Cost/Schedule Control System validation from the Department of Defense.

The system is a divisionwide method for reporting contract costs to the customer and a tool for program and line management. Together, the two validations mean the Cost/Schedule Control System is fully confirmed for all Defense Department contracts.

The latest confirmation is for all present and future production contracts. The contracts used to demonstrate compliance were the fiscal year 1985 and '86 Stinger production contracts. The earlier validation was for all present and future research and development contracts. The Rolling Airframe Missile full-scale engineering development contract was the demonstrator.

Seven in row for Electronics

For the seventh consecutive year, Electronics Division's small business department has won an outstanding rating from the Defense Contracts Administration Services in San Diego. This is the highest award from the organization.

The award letter listed a number of achievements. Electronics buyers awarded first-time purchase orders to 39 new, small and small disadvantaged businesses and 64 women-owned businesses in 1988. Purchase dollars awarded to small disadvantaged businesses in 1988 represented 3.7 percent of the total purchase dollars committed versus 1.7 percent the previous year.

GENERAL DYNAMICS

World

Published by: General Dynamics Corporation Pierre Laclede Center, St. Louis, Mo. 63105

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General Dynamics targets education

"Our commitment to competitiveness requires that the next generation be better educated, not less educated, than the preceding one. General Dynamics wants to do its part in assuring that it is."

TITH THOSE WORDS, Chairman and Chief Executive Officer Stanley C. Pace launched "Access to Success," an intensive and challenging approach to education. The program, in partnership with the University of Missouri-St. Louis, is only one of many corporatewide initiatives that attest to the company's efforts to improve the education of the country's youth.

Recognizing this urgent need, the company has introduced many programs into the communities of General Dynamics' divisions and subsidiaries. From scholarships to vocational training to direct involvement with teachers and students, the education of the nation's youth has become a priority at General Dynamics.

"Our educational partnerships at the divisions can take many forms depending upon the needs of the host communities," said William B. Pedace, corporate director-community relations. "Emphasis is placed on those projects providing benefits to both parties. If it's mutually beneficial, it has a better chance of becoming a lasting relationship."

Access to Success, for instance, encourages sixth, seventh- and eighth-grade students at three different school districts in St. Louis to select careers in science and mathematics by improving their understanding of those subjects. Language, reading and computer skills are also emphasized. The program allows teacher education majors at the University of Missouri-St. Louis to gain practical experience by interacting with the students.

"The program is designed to prepare students... for productive participation in a technologically transformed 21st century," Pace said. "Through such programs, a window of opportunity is opened for the business community to involve itself more intimately with our public school system."

Every division is involved. For instance:

✓ In 1984, Fort Worth Division, manufacturer of the F-16 Fighting Falcon, established its Math/Science Workshop in conjunction with the Texas Alliance for Minorities in Engineering. The program is geared toward middle and high schools and relates the importance of high school math and science to the business world

"Basically, it answers the question how will I ever use what you are asking me to learn," Pedace said.

The program provides workshops for area teachers and arranges for speakers from high technology companies to influence and motivate teachers and their students. Fort Worth also has produced a publication that relates textbook principles to F-16 design and construction.

✓ Data Systems Division headquarters also established the Regional Consortium for Education and Technology for administrators and teachers. The program is a partnership with St. Louis public and parochial school districts. The project offers better access to high technology in the schools' education programs.

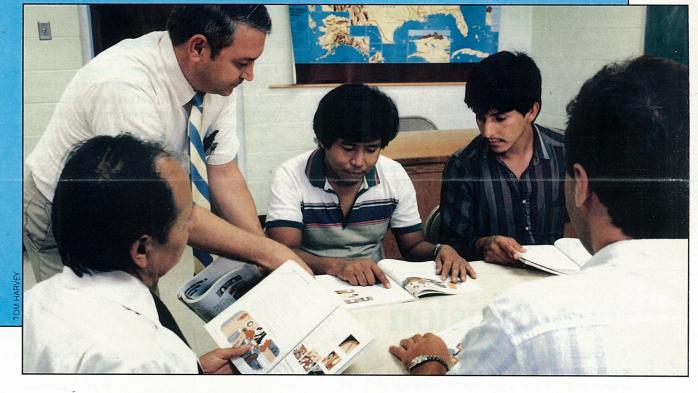
The program helps St. Louis public schools prepare science and technology magnet schools as part of a court-ordered desegregation plan. General Dynamics also provides administrators access to in-house company seminars.

Electric Boat Division's facility in North Kingston, R.I., which is helping to make the next-generation submarine, the *Seawolf*, began an "Adopt-A-School" program in 1987. The company "adopted" Cranston (R.I.) High School East, providing teacher grants for classroom materials, teaching aids and other needs. In addition, scholarships are awarded each year for the top male and female graduating students who plan to major in business, accounting, finance or the sciences in college.

✓ Money also has been contributed annually for the last decade by Pomona Division for Vocational Industrial Clubs of America machinist training, a vocational program at two local high schools for potential machinists and electricians. The division, which produces missiles and gun systems, has in turn hired some 44 graduates of the program.

■ Myron Holtzman

▼ Literacy volunteer George Stewart, a Fort Worth employee, assists students at the Wesley Adult Learning Center in Fort Worth as they practice conversational English skills.



Convair employee gets involved _____

Early tells others about sickle cell disease

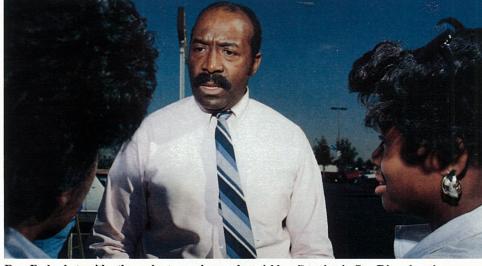
ONVAIR facilities analyst Don Early admits that he used to be one of those people who didn't want to get involved. And now? Now he is president of the Sickle Cell Anemia Education and Information Center of San Diego and serves on the board of directors of the National Association for Sickle Cell Disease, Inc.

"Back in the 1970s, a friend had put together this sickle cell organization and needed some workers," Early said. "I just didn't have the time for it. I grew up in Homestead, Pa., a steel mill town outside of Pittsburgh, and people did not get involved. One day my friend asked me to help her with a car problem and instead drove me off to her meeting. Little did I know the second meeting I

attended was the election of officers. They nominated me for vice president, and I just couldn't find the words to say no."

He hasn't said no since.

Early says that he spends about 600 hours a year helping to educate parents, schools, legislators and the general public about the disease—a genetic blood disorder that predominantly strikes blacks. A child



Don Early chats with other volunteers who conduct sickle cell testing in San Diego locations.

inherits the disorder from parents who both have the trait. There is no cure for the disease, which is characterized by red blood cells that become sickle-shaped when they lose oxygen because of a certain type of hemoglobin in the blood.

"We provide a tutorial program for students who usually have a high rate of absenteeism because of sickle cell 'crisis,'" said Early. Crisis is the onset of often

devastating pain that occurs from the anemia and obstruction of blood flow. "We have also arranged with the local Yellow Cab Co. that they will transport a sickle cell patient to any local hospital and bill our organization."

Other projects include financial assistance to patients who must use an expensive fusion pump to remove the toxic level of iron in the blood due to frequent transfusions.

But the association's most important task is fund-raising. "The biggest challenge locally and nationally is to raise money," Early said. "The majority of research money is going to cancer or AIDS. Sickle cell anemia is not fatal, but doctors cannot prevent other lifethreatening conditions from occurring

because of the disease."

Early speaks to legislators and celebrities nationwide. He recently met with Louis Sullivan, the secretary of Health and Human Services.

"One of my pleasurable surprises was meeting people from other GD divisions who are involved in sickle cell, such as Shirley Stevenson at Fort Worth Division, who is a coordinator in the Fort Worth chapter," Early said.

■ Julie Andrews

Fort Worth analyst uses her friendship to help mentally ill

ORT WORTH OPERATIONS Analyst Elizabeth Valdez is aware that the stigma of mental illness keeps many people from taking on the kind of volunteer work she performs.

But Valdez has found that time spent with her client in the COMPEER, or companion, program is a lot like being friends with anyone else who has special needs.

As a COMPEER volunteer, Valdez promised to spend at least one hour a week for at least a year with Ellen (not the woman's real name), who is mentally ill. The two have become friends. Valdez intends to continue the visits even though she fulfilled the one-year commitment several months ago.

"I've known Ellen for about a year and a half," Valdez said. "We celebrate birthdays together and go to events in the community, like Oktoberfest, that she wouldn't go to on her own.

"Part of my duty is just getting her out of the house and making sure she is taking her medication. It's much better than just a social worker situation, where she'd only be seen about once a month."

COMPEER is administered by the Tarrant County Mental Health Association. "The volunteers meet with the referring mental health professional who is working with their friends to set goals and plan activities designed to improve the client's self-esteem, sense of belonging and social skills," said Clay Grizzle of the Mental Health Association.

"In most cases, mental health professionals do not have time to be a close friend to their clients, too," he said. "A therapist or relative can help, but they cannot provide the friendship that is often the one missing ingredient in the lives of many who are undergoing counseling for emotional or mental problems."

COMPEER volunteers receive several hours of training. "The training they give you is to be a friend because that's your primary duty," said Valdez. "I don't try to be a psychologist, and I wouldn't try to diagnose Ellen."

Valdez first learned of the COMPEER program when a division newsletter called for volunteers. "I became more interested after watching a television program on the homeless," she said. "It highlighted the fact that many homeless people also suffer from mental illness."

Ellen, an elderly woman, lives alone in an apartment attached to a care institution. She has virtually no contact with her family, partly because of the stigma of her past mental problems.

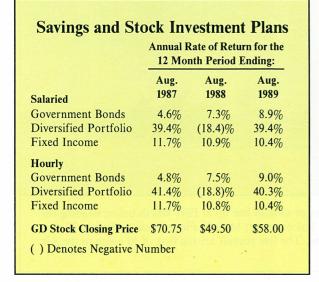
Valdez said she has accepted Ellen as a friend and peer despite the difference in their ages. "I've noticed that most of the COMPEER volunteers are younger people, and many are college students," Valdez said. "I think the program could really benefit if more people in their middle or later years were willing to get involved."

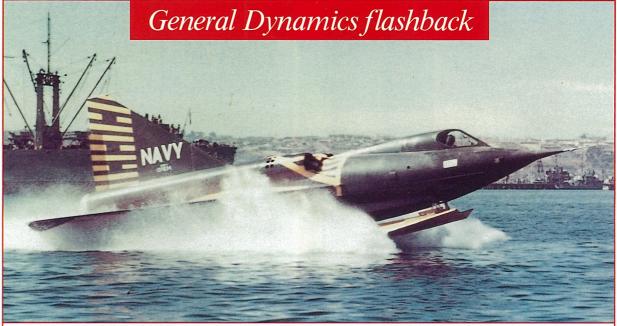
COMPEER clients include children as well as adults who have mental illness. There are more than 100 COMPEER programs in 35 states and Canada, Grizzle said.

Valdez said Ellen has shown marked improvement in her social skills during the time the two have been friends. "You can tell how much better she's gotten because she's become very involved in her church, and she's even doing some volunteer service herself now," Valdez said.

That summarizes the main goal of the COMPEER program: to assist the mentally ill as they return to fulfilling, productive lives in the community.

■ Joe Stout





A Convair Sea Dart skims across San Diego Bay during a test run.

Sea Dart made waves in mid-1950s

In 1953, the Korean armistice was signed, Dwight D. Eisenhower was inaugurated, Mount Everest was scaled, and a little-known airplane—Convair's XF2Y-1 Sea Dart—first flew.

The delta-winged jet with retractable hydro-skis became the first water-based aircraft to fly supersonically. But the program never advanced past the prototype stage and only five aircraft were built.

Sea Dart was one of three unusual Navy-Convair experimental programs of the mid-1950s. The others were the XFY-1 Pogo, the first plane to take off and land vertically, and the four-engine R3Y Tradewind, the first turboprop water-based transport.

Sea Dart was as much an experiment in deployment strategy as it was in technology. During the 1950s, the Navy was searching for alternatives to carrier-based fighters by developing vertical takeoff technology in aircraft like Pogo and by evaluating water-based designs like Sea Dart. In the latter case, proponents wanted to take advantage of the world's waterways — the longest and most accessible airplane runways.

But the "mobile basing" concept eventually fell out of favor because of Sea Dart's lack of an approved operational requirement and shortage of funds. "The first land-based anti-aircraft missiles were being developed with some success and this convinced many that manned interceptors in general would no longer be necessary," said Ernest G. Stout, Sea Dart's chief designer, who is retired in California. Others claim that the Navy was more interested in building carrier task forces, not seaplanes.

The first Sea Dart flew on April 9, 1953. The engines were housed in a molded fuselage that kept them high above the waterline. The plane could take off and land in open seas with waves as rough as six to 10 feet high 50 to 100 feet apart.

While much was learned in the program, especially in seaplane hydrodynamics, Sea Dart is often remembered because of a spectacular accident on Nov. 4, 1954, above San Diego Bay.

Convair was demonstrating the Pogo at Brown Field for the media. To accommodate unanticipated media requests to view the Sea Dart, the day's Sea Dart testing was interrupted so the press entourage could drive to San Diego Bay to watch it perform.

The demonstration ended in tragedy when the Sea Dart piloted by Chuck Richbourg broke up at high speed over the bay. The plane buffeted violently and disintegrated into flaming pieces. Richbourg was killed and crash photos were highly publicized.

"The plane was approaching 500 knots at 300 feet and it started to porpoise," said Stout, who vividly remembers handing Richbourg the flight change papers for the flyby. "The engines broke away and ended up flying clear across the bay. Every top aviation writer and photographer in the country witnessed it."

Work on Sea Dart was suspended until the Navy Accident Board completed its investigation. Tests resumed in December 1954 and continued through fall 1957 when the program was canceled.

Aviation buffs can view a Sea Dart at the San Diego Aerospace Museum where it sits, skis extended, aboard a special pedestal. The plane was restored by many of the same volunteer craftsmen who refurbished a Consolidated PBY-5A Catalina amphibian airplane also displayed at the museum.

"You usually don't live long enough to see your work on a pedestal at an aerospace museum," said the 76-year-old Stout, who is writing a book about seaplanes. "I'm quite proud of that."

■ Chris Schildz

Land Systems aces MRP certification test

AND SYSTEMS DIVISION recently became the first representative of the defense industry to receive a class "A" certification for manufacturing resource planning.

Manufacturing resource planning allows company planners to use resources more effectively in production. It is the cornerstone of total quality management, an industry philosophy emphasizing systematic and continuous improvement in product design, manufacture and marketing.

Oliver Wight Cos., a nationally recognized private firm specializing in corporate resource planning and related technologies, presented its top certification to Land Systems, maker of the M1 Abrams tank, during ceremonies at division headquarters in Sterling Heights, Mich.

Three Land Systems facilities—the Central Office Complex, Detroit Arsenal Tank Plant and Sterling Plant—rated exceptionally high in an independent audit of their capabilities to qualify for the class "A" certification. "This is a prestigious achievement because no other aerospace and defense company has received this rating," said Jim Correll, principal, Oliver Wight

Cos., in a letter to Michael M. Grujicich, Land Systems director-manufacturing resource planning.

The audit included a checklist of 35 overview questions and more than 300 other questions measuring each facility's overall effectiveness from strategic planning to product delivery. The checklist focuses on the planning and control process, data management, continuous improvement process and performance measurements.

"Material resource planning is a tool. Class 'A' certification means you use it well, which puts you in an elite group," said B. Edward Ewing, General Dynamics corporate vice president-operations.

"To our customers, this means that our resources are thoroughly integrated and our employees are totally committed to designing and building the highest quality tanks at the lowest possible price," said Robert W. Truxell, vice president of General Dynamics and general manager of Land Systems. "To our employees, it means that their hard work has set the standard for all other defense companies to follow."

■ Don Gilleland



Brian Evans at his Pomona numerical control machine

Evans' Olympian effort captures fifth place in machining

RIAN EVANS is fifth in the world.

The 19-year-old Pomona Division machinist finished fifth in the 1989 Vocational Industrial Clubs of America (VICA) International Skills Olympics in Birmingham, England, Aug. 28-31.

Evans represented the division in the computer numerical controlled machining competition. He and Chris Conner, a former Valley Systems Division employee, were competitors in machining on the 16-member U.S. team. They competed against numerical control machinists from 12 other countries in metric computation, computer-aided manufacturing skills, parts programming, machine application and math computations.

Evans said the competition was stressful, but he enjoyed the challenge. "The best part was meeting people from other countries," he said. "It was strange not even being able to talk with some of my competition, but I made some good friends with other machinists, especially those from England and Australia."

"There were 550 possible points and only 11 points separated the top five scores," said Jack Brady, Pomona's director of fabrication who served as a technical expert at the Olympics. "Brian put forth a topnotch effort and his high score represents quality work."

Evans won the gold medal in precision machining at the 1988 nationals, which qualified him for a spot at the international event this year.

This was the 30th International VICA Olympics. It is held in a different country each year. The Birmingham contests had 382 people from 22 nations competing in 37 events. The Olympics test skills in such diverse areas as hairstyling, cooking, welding, jewelry design and plumbing. The event was opened by Britain's Prince Edward. Prime Minister Margaret Thatcher spoke at the closing ceremonies and presented medallions to the winners.

Evans, who began at Pomona Division last year, graduated from Fontana (Calif.) High School. He is the fourth student from that school to compete in the International Olympics. His high school instructor, Bill Clarke, has worked extensively with the division in obtaining support for the VICA program. The division has supported a VICA Skills Olympic team since 1983.

Division support extends beyond training machinists and sponsoring teams. Many employees work with the organization as judges at various local, state, national and international competitions and in helping to set up the competition sites. In addition, John Whiteside, Pomona's vice president-human resources, serves as VICA National Committee chairman and Dan Luchsinger, director of communications, is a member of its national Public Relations Committee.

VICA is a nationwide organization that brings trade, industrial, technical and health occupation students together with representatives from business and industry.

■ Eric Solander

Ethics inquiries approach 4,000

Directors of General Dynamics' ethics program have received nearly 4,000 telephone calls, letters and visits from employees this year, according to Kent Druyvesteyn, staff vice president-ethics program.

"The volume of communications is a measure of the confidence employees have in the ethics communications system," Druyvesteyn said. "Employees have come to expect a timely response, which they deserve. We can't always provide the answer wanted, but we try to listen and explain.

"Some employees are still uncomfortable using the communications system. Occasionally an employee will ask: 'Is our conversation being recorded?' The answer is emphatically 'no.'"

Other employees are concerned that someone may overhear their conversation if they call from work. In such cases Druyvesteyn advises employees to use a pay phone or to call from home. The call is free if an employee phones the 800 number at the Corporate Office.

The ethics program director answers the hotline

during normal business hours unless occupied with another call or momentarily out of the office. In such cases callers receive a recorded message and the opportunity to leave their number if they desire a call back.

The same answering device is used after business hours. Employees are urged to call back if there is no response to their message within eight hours. It is likely the ethics program director's attempts to reach them have been unsuccessful. The director does not leave messages when calling back and will speak only to the individual who called.

Callers are not required to give their names. The ethics program director will explain what limitations, if any, anonymity may place on responses.

If an employee would rather write than call, there is a private post office box opened only by Druyvesteyn. The address:

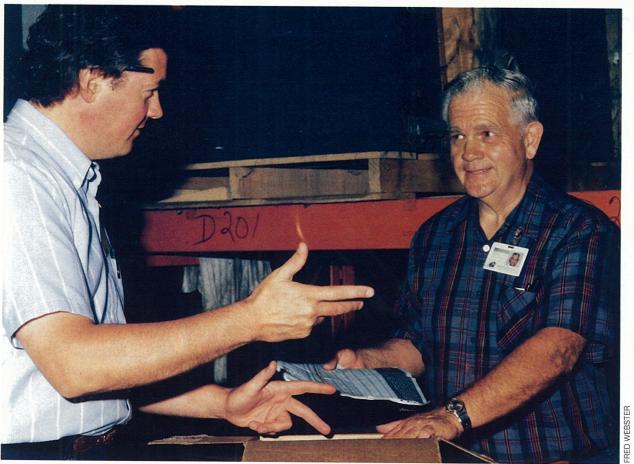
Ethics P. O. Box 50263 Clayton, MO 63105

Ethics program directors and hotline numbers (* = Hotline) Division/subsidiary Location Ethics program director Phone number 800-433-8442* St. Louis Kent Druyvesteyn Nationwide Quincy James F. O'Hearn 617-786-8300 AMSEA/Quincy ext. 702 316-946-7880* Wichita Mark Bagley Cessna John C. Barrons 619-573-8120* Convair San Diego St. Louis Kent Druyvesteyn 314-889-8456* **Corporate Office** Washington Leland B. Bishop 703-553-1343* St. Louis William E. Tucker 314-851-8906* **Data Systems** Camden John Brown 501-574-4220 D. G. (Dee) Chamberlain **Fort Worth** 817-762-7014* 401-848-8650 Edwin A. Coolbaugh Newport 203-823-2700* Norwich James M. Cleary **Pomona** William E. Kirke 714-868-6620* 619-547-4682* San Diego Roger E. Barnes Carol J. Hussey 313-825-8629 **Sterling Heights** 203-441-8000* William A. Miller **Electric Boat** Groton Robert L. Wylie 201-636-0155* Avenel 803-553-4850* Charleston Cheryl A. Lyons **Quonset Point** Roland J. Plante 401-268-2705* M. Ray Reynante San Diego 619-573-5384* Electronics 817-777-1400* **Fort Worth Fort Worth** Jerry A. Sills 915-691-2131* **Abilene** Jon A. Cohen 800-637-0399* Freeman United Coal James T. Ryan Marion **GD** Services 314-851-8997* St. Louis **Doris Chiste** 313-825-5888* Detroit Charles J. Stieber **Land Systems** Thomas E. Ansley 419-221-8555* Lima 717-876-5797* Scranton Richard W. Gray Edward K. Wilverding 800-225-0926* Material Service/Marblehead Lime Chicago Roy E. Harris 714-868-2001* Pomona **Pomona** Mike Crutchfield 501-574-4446* Camden 602-729-6505 Navajo Darrell L. Springer 619-573-8367* San Diego Alda O. Jorgenson **Space Systems** Howard F. Biegler 407-730-0185* Cocoa Beach 805-865-8072* Vandenberg AFB George Mees Valley Systems 714-945-7772* Rancho Cucamonga **Bill Coleman**



FALCONS, FLOGGERS AND FULCRUMS. F-16 aggressor aircraft line up at Fort Worth before heading for their new homes in South Korea. The two closest Fighting Falcons sport MiG-23 Flogger paint schemes. The remaining aircraft are painted to resemble MiG-29 Fulcrums. The five aircraft are the first of 10 going to the Air Force's 126th Fighter Squadron.

ALE DAVI



Brad Marchand (left) and Rene Bordeleau verify packages in a warehouse at Electric Boat.

Signs point to hearing for deaf worker

ENE BORDELEAU SAYS HE FEELS like a typical employee at Electric Boat Division. However, there is a difference. A clerk in the traffic and transportation department, Bordeleau is deaf, having lost his hearing early in childhood because of a fever.

But he has answered that challenge at work by teaching his supervisor, Brad Marchand, how to communicate with him through sign language. He and Marchand "sign" back and forth as easily and comfortably as two colleagues would talk to each other. "It was easier to achieve a rapport, for communication's sake, if I learned to sign," Marchand said.

Instruction for Marchand consisted primarily of watching Bordeleau sign in order to become familiar with the language. He gradually became fluent. "It was really a case of on-the-job training," Marchand said.

Marchand has been in the traffic and transportation department for 15 years, 10 of them as a supervisor. Previously he worked as a carpenter at the division on the second shift, where he had his first introduction to sign language. A deaf co-worker taught him the letters of the sign alphabet, allowing for some communication on the job.

Marchand was switched to a first-shift planner in receiving, where he met Bordeleau. He learned from Bordeleau how to sign simple words such as "brother," "sister," "mother" and other family members. The two started working daily on sign language after Marchand was promoted to supervisor.

"You can look at books to learn sign language, but you don't know an individual's way of signing until you learn it right from the person," Marchand said. "I'd keep asking Rene over and over to repeat his signs until I understood. It wasn't cut and dry. I had to learn it from him, how he communicates, in his own unique way."

While some co-workers write notes to Bordeleau, Marchand said he and Bordeleau can speak solely in their shared language. "We never have to write messages back and forth anymore," he said. "We're friends more than co-workers."

Bordeleau agreed. "Brad is a good friend and a good person," Bordeleau signed.

Bordeleau signs along with occasional speech. He also reads lips very well. Most of the sign language he uses was taught to him by his wife Josephine, who is also deaf. She learned the rudiments of signing while in school and expanded her knowledge later.

An Electric Boat employee for 25 years, Bordeleau said: "I get along with everybody. I like my job and I have good people to work with."

Bordeleau distributes receiving reports and unpacks and checks packages, working in the office and the warehouse. The wide-open area for unloading and unpacking is neat and orderly, yet active with the movement of forklifts. He has to be cautious in the warehouse because of the forklifts. "I use peripheral vision

to keep myself aware of any movement on the warehouse floor," he said.

Bordeleau consistently demonstrates great accuracy in processing paperwork, according to Marchand. Moreover, Bordeleau has always shown a willingness to think innovatively. "If there's a better way to do something on the job, he'll suggest it," Marchand said.

Until a few months ago, Bordeleau worked for five hours every weeknight at a local community college in addition to the first shift at Electric Boat. When the college originally called for a recommendation, James Watt, manager of traffic and transportation, immediately gave it. Said Watt: "I told them, 'Of course I'll recommend him. Just don't take him away from me.'"

■ Judith C. Evans

New Norwegian F-16s demonstrate flexibility of production process

ORT WORTH DEMONSTRATED the flexibility of its F-16 production process recently by building and delivering two early-version F-16B Fighting Falcons complete with all subsequent updates.

The aircraft are a production Block 15 configuration and are attrition replacements for the Royal Norwegian Air Force. Fort Worth's primary products are Block 40 F-16Cs and Ds. The division still makes some Block 15 F-16As and Bs for Indonesia, but the Indonesian and Norwegian aircraft use different models of the Pratt & Whitney F100 engine.

Tom Collins, Fort Worth's F-16A/B program director, said the Norwegian aircraft deliveries were possible because of the built-in responsiveness of the F-16 production system, which can be tailored to satisfy specific customer needs.

"Since 1984, the Norwegian configuration has been updated with 162 engineering change proposals (ECPs), including systems enhancements under the F-16A/B operational capabilities upgrade program," Collins said. "The two new airplanes are up to date with all ECPs.

"We're making certain that we will be able to remain responsive to all our F-I6A/B customers' needs well into the next decade in case similar requirements arise for other countries."

Congress was notified in September that Norway is considering the purchase of additional F-l6A/B aircraft as attrition replacements. These aircraft are also expected to be built at Fort Worth.

The F-16Bs flew from Fort Worth to Bodo, Norway, with U.S. Air Force tanker aircraft providing aerial refueling.

The aircraft are the first delivered to a European nation from the Fort Worth assembly line. The 72 Fighting Falcons produced for Norway between 1980 and 1984 were all delivered from the Fokker-Schipol F-16 coproduction facility in the Netherlands.

While these are the first European aircraft delivered from Fort Worth, the Dutch and Belgian assembly lines delivered six F-16s to the U.S. Air Force in late 1983 and early 1984. These replaced Fort Worth-built aircraft that were diverted from U.S. Air Force deliveries to Pakistan's air force.

■ Joe Stout



Bob Jungers (right) and Kevin Vacca pose with a flight line mobile unit and an F-16.

Pair fights fire, saves aircraft and pilot

OB JUNGERS, A FLIGHT operations specialist at Fort Worth, saw his duties go from ordinary to hair-raising in a few seconds one day in August.

Jungers' usual duties include driving a mobile unit on the division's flight line, where he is the "pilot's eyes" outside F-16s taxiing before test flights. Staying with the plane in a radio-equipped vehicle, he checks for potential problems that the pilot can't detect.

That day, he went beyond his normal responsibilities by rushing to the aid of a burning F-16.

The aircraft, with test pilot Keith Giles aboard, caught on fire during a maximum-power, afterburner takeoff roll. Through their radio, Jungers and a passenger, Systems Specialist Kevin Vacca, were among the first to know of the emergency and respond.

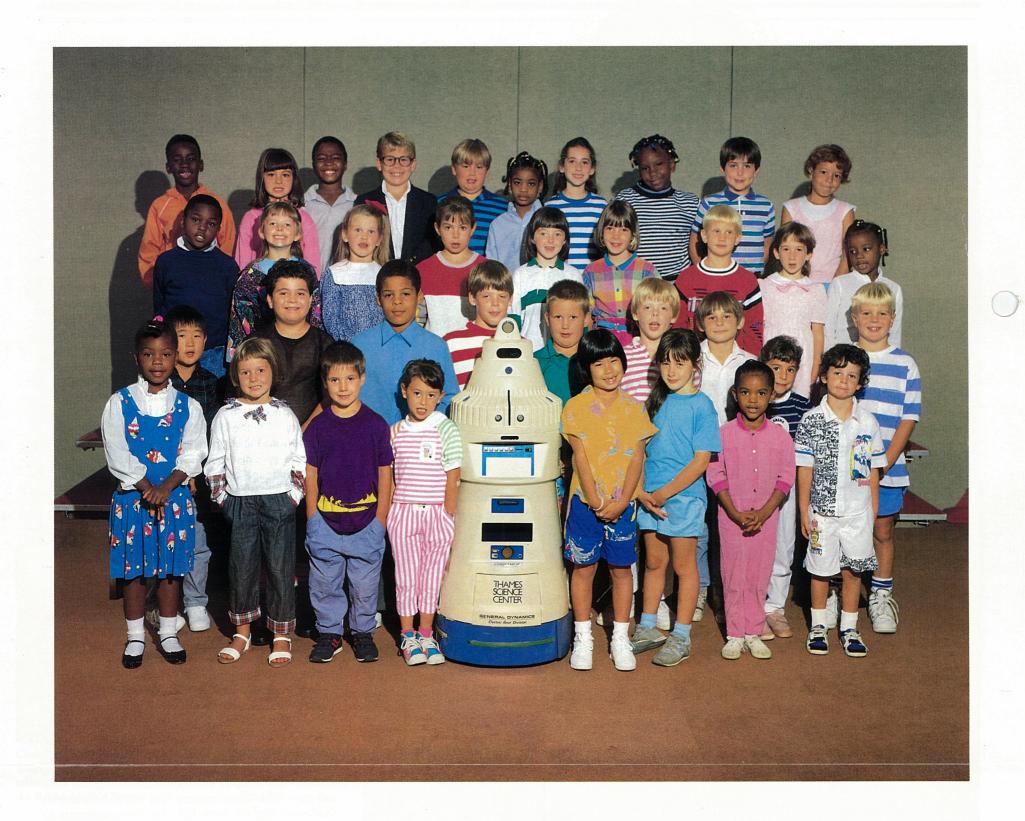
"He radioed for fire trucks, then he and Vacca raced after the aircraft, which was still skidding down the runway spewing smoke, flames and wheel assembly parts," Giles said.

They arrived at the runway barricade seconds after the airplane stopped. "We screeched the mobile to a halt and I yelled, 'You get the pilot and I'll get the fire," Jungers said. "I grabbed a fire extinguisher from the mobile, climbed over the wire barricade and ran under the aircraft."

Vacca grabbed a second extinguisher after the first one quickly ran out. Jungers doused the fire before it ignited a large puddle of fuel dumped on the runway when the airplane's engine was shut down.

Ed Petrushka, Fort Worth's vice president of research and engineering, commended Jungers for "quick reaction, clear thinking under pressure and fearless action which prevented an emergency from escalating into severe injury to the pilot and loss of the aircraft."

■ Joe Stout >



The new teacher has 137 microchips, an infrared sensor, and little rubber wheels.

When he gets the chance to teach science, he comes alive. And so do his students.

He is Tharogem I, robot star of Project RobotACTS.™ It's a new education project developed by the Thames Science Center in New London, Connecticut, and now supported by the National Science Foundation.

Tharogem gets kids excited about the principles of physics. And about programming. And about building simple robots of their own.

He gets us excited, too. We're concerned that so few American students are inspired by physical sciences. That's why we at General Dynamics helped start this program. So far, more than 6,000 Eastern Connecticut students have seen Tharogem demonstrate principles of light, sound, electricity, magnetism, and math.

In return, the students are demonstrating something, too. Enthusiasm for learning.

GENERAL DYNAMICS
A Strong Company For A Strong Country

News Briefs

Gains at Cessna, Material Service, bolster earnings

The best quarterly performance by the company's general aviation segment since Cessna joined General Dynamics helped to increase the company third-quarter earnings slightly over last year.

"Strong customer response to Cessna's line of proven and new business jets has doubled the backlog of Citation jets since this time last year," Chairman and Chief Executive Officer Stanley C. Pace said. "Receipt of orders is more than 50 percent ahead of 1988.3

Significant improvements in earnings also came from Material Service and submarine operations

Earnings for the third quarter were \$76.5 million, or \$1.83 per share, on sales of \$2.5 billion. The figures for the same period in 1988 were \$76.4 million, or \$1.82 per share, on sales of \$2.3 billion.

For the first nine months, earnings were \$210.3 million, or \$5.03 per share, on sales of \$7.4 billion. In the first nine months of 1988, earnings were \$208.8 million, or \$4.97 per share, on sales of \$7.1 billion.

Company aids 'quake relief

Valley Systems Division acted quickly after the earthquake that shook the San Francisco area Oct. 17.

The division, which is located outside Los Angeles, announced relief plans the day after the earthquake. Employees wanting to give blood received up to two hours of paid time off work to visit a local blood donor center. Meanwhile, cash donations to the Red Cross were collected at the facility by volunteers from the Valley Systems chapter of the National Management Association.

About 270 employees gave blood and the Red Cross collection netted more than \$8,600. In addition, the division's Fair Share Club gave \$8,500 and the company contributed \$15,000.

F-16 fliers blow away rivals

Teams flying F-16 Fighting Falcons hogged the honors in Gunsmoke '89, a biennial gunnery and bombing competition matching aircraft from throughout active and reserve Air Force units.

F-16s won all ground events, a first for any type of aircraft in Gunsmoke, as well as the flying portion at this year's event, held Oct. 1-13 at Nellis Air Force Base, Nev. Gunsmoke '89 marked the F-16's 16th victory in as many appearances in major bombing competitions.

The overall competition was won by the 169th Tactical Fighter Group from McEntire Air National Guard Base, S.C. Capt. Pat Shay of the 944th Tactical Fighter Group, an F-16 Air Force Reserve unit, won the Top Gun event.

0 First Phalanx sold to Canada

0

Pomona Division has delivered the first of 13 Phalanx gun systems to Canada's Paramax Electronics for installation aboard that country's new city-class frigates. The delivery is part of direct sales contracts, worth more than \$65 million, negotiated last year with the Canadian firm, Paramax Electronics Inc. of Montreal.

Four Phalanx systems are also being sent to Litton Systems, Inc. shipbuilders for upgrading current Canadian ships.

This is the first direct commercial sale of Phalanx to another nation. Normally, the division works through the Navy's foreign military sales process.

GENERAL DYNAMICS

Volume 19 Number 11

November 1989

Pace, Rogers rev up TQM drive

OP COMPANY OFFICIALS sent total quality management off on a running start at General Dynamics by beginning kickoff meetings at the divisions during October.

"Credibility, confidence and trust are necessary to gain the commitment to TQM," said Chairman and Chief Executive Officer Stanley C. Pace, who began each meeting with an overview of total quality manage-

ment. "We have to convince each and every employee that we can improve on everything we do continuously, and since we can do it better, we should do it better."

Traveling with Pace to the meetings were President and Chief Operating Officer Herbert F. Rogers and Staff Vice President-Total Quality Management Joseph A. Frankovsky. By the end of October, they had met with Cessna, Convair, Electric Boat, Electronics, Fort Worth, Land Systems, Pomona, Space Systems and Valley Systems. Meetings with the Corporate Office, Data Systems and General Dynamics Services Co. are set in December. Division general

managers were hosts for the meetings and committed their support to total quality management.

Pace defined total quality management as "a way of questioning and improving every aspect of a product or service or activity, and improving it not once, but continuously."

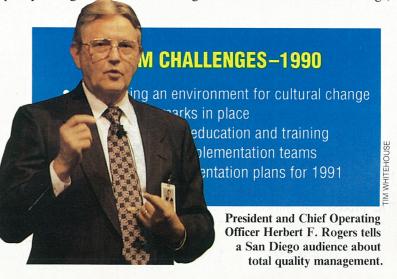
Rogers, who covered the implementation of total quality management at the division level, said he had "rarely seen anything that I've been as excited about as this. There are three things about TQM that make it stand out: people make a real difference; implementation is designed to let them make a difference; and

everyone makes a contribution."

"Nineteen eighty-nine is a year of getting ready for TQM," Rogers said. "Nineteen ninety is a year of action."

Rogers outlined five challenges for total quality management in 1990 that employees should work together to meet:

• Establishing an environment for cultural change;



- Putting benchmarks in place;
- Executing planned education and training;
- Starting process implementation teams;
- Establishing implementation plans for 1991 and beyond.

"Our vision is to create total customer satisfaction by all of us, working together as a team, in a caring and ethical environment, continuously improving each and every one of our processes using world-class capabilities," Pace said. "This vision is a major part of what we have to build into our culture. Our determination is to achieve our vision."



Cessna's CitationJet has attracted 53 orders although first delivery is not expected until December 1992.

Cessna's newest jets fill up order books

ESSNA AIRCRAFT CO. officials returned home with a pocketful of orders after announcing two new business jets at the recent National Business Aircraft Association meeting in

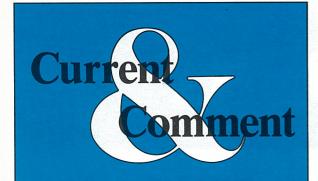
Cessna took the first order for its top-of-the-line Citation IV jets, which will carry eight passengers. Cessna's other new aircraft, the six-passenger CitationJet, attracted a flood of 53 orders.

The new jets are Cessna's response to the resurgent business aircraft industry. "The Citation IV will be built to deliver exactly what dozens of major corporations

told us they wanted most in a midsize jet," said Roy H. Norris, senior vice president-marketing. "There is clearly a substantial market for a new technology, entry-level jet (like the CitationJet), including more than 13,000 companies that currently operate cabin class piston aircraft, turboprops and older jets."

The Citation IV will have transcontinental range, more powerful engines and a 26-inch-longer cabin than the Citation III. At a fully equipped price of \$8.8 million, the Citation IV will compete effectively with midsize business jets costing \$11 to \$12 million. First

(Continued on Page 2)



A three-sided problem needs a three-sided solution. That's the thrust of comments made earlier this year by GD Chairman and CEO Stanley C. Pace at a national conference of the Association of Government Accountants. A summary of Pace's remarks, titled "Crisis in Procurement—The Contractor Perspective," is presented here.

FOR THE PAST FOUR DECADES, America's military-industrial complex has successfully carried out its assigned mission: protecting the freedom of U.S. citizens. Despite this success, the industry, the Department of Defense and Congress could have achieved their objectives for less money and without the "horror stories" of high-priced hammers and coffee makers. All three parties are part of the problem in the procurement process and all three must be part of the solution.

When we at General Dynamics expanded the company's ethics program in 1985, we knew we had to translate the fundamental principles of ethics into a set of clear and specific instructions. The process was difficult and costly. But the policies and procedures we wrote and put into effect worked because they let employees know exactly what is acceptable conduct and what is not. In our ethics program, as in our other administrative processes, we tried to eliminate the vast gray areas that make so many defense procurement rules uncertain and frustrating.

In the past, many of us in industry supported rules and regulations that were general, so that the government people and contractor people in the field would have the freedom and flexibility to apply their judgments based upon the unique aspects of the individual cases. The exercise of this kind of flexibility has resulted in judgments being made years later by people not present at the negotiation, not knowledgeable of the unique facts in the case and based upon their subsequent interpretation or definition of the rules. As a result, we find ourselves today in adversarial relationships, typified by indictments, fines and suspensions.

In such an atmosphere, all of us are losers: industry, the military services and the defense of our country. To correct this, Congress and the Defense Department must use their authority to define the rules of the game, and to do so as explicitly and unambiguously as possible. We in industry need a set of rules that cannot be misunderstood and that are not subject to "Monday morning quarterbacking."

Given simple and clear rules, self-governance can and will succeed in our industry.



The West Virginia rests at dockside during christening ceremonies at Electric Boat.

Subs sail past two milestones

LECTRIC BOAT-BUILT submarines crossed two milestones in one week during mid-October. The Trident submarine West Virginia (SSBN 736) was christened Oct. 14 and the attack submarine USS Topeka (SSN 754) was commissioned Oct. 21.

West Virginia is the 11th Trident built by Electric Boat and the third to carry the advanced Trident II (D-5) missile. USS Topeka is the third attack submarine from Electric Boat to feature major design improvements, including the AN/BSY-1 advanced combat system, retractable bow planes and a hardened sail for breaking through Arctic ice.

The shipyard in Groton, Conn., drew over 3,700 guests for the christening ceremony, which featured remarks by West Virginia Sen. Robert C. Byrd, whose wife, Erma O. Byrd, is the ship's sponsor.

Addressing the crew members of *West Virginia*, the senator urged them to remember their mission of deterrence. "If we ever were to launch the missiles of the *West Virginia*, our basic goal, to deter war, would have failed. ... When you get bored on those long patrols, when nothing is happening, remind yourselves that you are succeeding in your mission, and that millions of your countrymen rely on you directly to safeguard their security and protect our way of life."

After her husband's remarks, Mrs. Byrd christened the ship by smashing a bottle of champagne against a striker bar welded to the sail of the submarine. The champagne had arrived from the state of West Virginia.

The following weekend, over 1,000 guests witnessed the commissioning of USS *Topeka* into the Navy at the Naval Submarine Base in Groton. *Topeka* was launched at Electric Boat in January 1988.

Secretary of Labor Elizabeth Hanford Dole, ship's sponsor, reflected during her remarks on the changes that had occurred since she christened *Topeka* 21 months earlier. "Nations are learning that barbed wire can no longer hold back the hopes and dreams of their people," she said. "From Europe to the Far East, from

Africa to the Americas, the world is being swept by powerful forces for democratic change."

But she cautioned that such changes have not diminished the need for peace-preserving instruments such as *Topeka*. "Friendly words and promises are not enough to guarantee the security of America," she said. "Our strength must speak for itself."



Guests at the commissioning of the USS *Topeka* pay their respects to the flag: (from left) Capt. Norman J. Shackelton, supervisor of shipbuilding at Electric Boat in Groton, Conn.; Secretary of Labor Elizabeth Hanford Dole; Mildred Murphy Wallace, matron of honor; Sen. Robert Dole; Capt. George D. Moore, commodore, Submarine Squadron Two; and Cmdr. Timothy M. Reichert, commanding officer, USS *Topeka*.

17th Trident for Electric Boat

Naval Sea Systems Command awarded a contract to Electric Boat on Oct. 18 to build an *Ohio*-class Trident missile-firing submarine.

The ship would be the 17th Trident, all built by Electric Boat. Eleven have been completed, including the *West Virginia*, christened Oct. 14. The contract for the latest Trident is for \$576.5 million. Completion is scheduled in 1995.

Cessna

(Continued from Page 1)

flight is scheduled in the spring of 1991, Federal Aviation Administration certification in late 1992 and first delivery the following spring. Golf great Arnold Palmer, who operates a Citation III, placed the first Citation IV order.

The CitationJet marks Cessna's re-entry into the light jet market, which the company established with the Model 500 and Citation I. The new aircraft will have a maximum cruising speed of 437 mph. Its range will be 1,500 nautical miles with four passengers. The Citation-Jet was priced at \$2.395 million for the first 50 orders and \$2.495 million thereafter. First flight is set for spring 1991, Federal Aviation Administration certification in October 1992 and first delivery in December 1992.

The Atlanta meeting also marked the conclusion of a world tour by Cessna's newest operational business jet, the Citation V. Two aircraft wound up their tour of 31 countries in Atlanta.

Land Systems gives quality tips to Honda

OUR SENIOR EXECUTIVES from Honda, one of the world's leading automobile manufacturers, recently visited Land Systems Division and found many of the procedures for managing design changes in M1 tanks were applicable to cars.

"Many of the concepts which you have demonstrated to us can be successfully implemented at Honda of America, in particular the 'team' concept of engineering change processing and your computerized status tracking system," said Ryuji Murata, one of the visitors from Honda of America. "Your progress in these areas during the last four years is enviable indeed."

The Honda executives were particularly interested in Land Systems' "cell" concept, which calls for persons from all functional areas involved in engineering change processing and change management to work in one location, or cell. The system also encourages early customer input to ensure concurrence to product specifications.

Murata, senior staff adviser of Honda of America's

Marysville, Ohio, auto plant, cited a need for ideas that would help reduce processing time and improve quality of engineering changes.

Murata said in some instances his plant's office management systems have not kept pace with rapidly expanding manufacturing operations during the past 10 years.

"The cell concept shortens processing time, results in higher quality and reduces costs of change management," said Land Systems' Greg Tomaszewski, deputy program manager-configuration control. "It's a bit of total quality management a shade ahead of its time."

Norman S. Dyer, assistant program manager-configuration, briefed the Honda team on the cell concept while Tomaszewski took the group to the cell to demonstrate the change control network.

Murata said he would like another visit to Land Systems for other Honda senior executives.

■ Karl Oskoian



A barge heads out to sea carrying the space structures that will become an artificial reef.

Old launching pad structures take a dive

NCE CONSIGNED TO RUST on a scrap heap, old launch pad structures from Cape Canaveral have found new life. A barge carrying the old complex 36A umbilical tower, a Centaur support stand and the missile access stand from Complex 29 were sunk in 120 feet of water 18 miles east of Cape Canaveral to form an artificial reef.

A coalition of organizations including Space Systems Division, and the Air Force and Navy, who donated the launch pad structures, made the project possible. The complex 36A umbilical tower, removed from the launch pad when its complete refurbishment began, supported many historic Atlas/Centaur launches, including the Pioneer, Mariner and Surveyor missions.

Dubbed Humminbird Space Reef—the reef was named after a major donor company that spells "hummingbird" without the g—the 400-ton tangle of Ibeams, steps and platforms forms an ideal growing

environment for coral. With the coral comes more marine life and a boost for the entire natural food chain.

"Most artificial reefs are made up of old ships, barges and rubble," said Stephen Phillips of the Artificial Reef Development Center in Washington, D.C. "This will be the first reef in the United States comprised solely of historical space structures."

Phillips said there are over 500 artificial reefs lining the coasts of the United States.

In recent years, natural reefs off the coast of Florida have been damaged by a variety of sources. Dave Murphree, president of the Brevard County Artificial Reef Association, said the artificial reefs duplicate in a short time what nature requires centuries to do. "A naturally occurring reef can take hundreds of years to develop," he said. "An artificial reef can be productive within three years, overnight by comparison."

Book drive to shift library into gear

IN CHINLE, ARIZ., on Navajo tribal lands, nearly 4,000 area residents must travel as far as 60 miles to borrow books from a public library. The Navajo Community College library is a relatively convenient 30 miles away, but it is open odd hours on weekdays and not on evenings and weekends.

A local library is something Chinle's educational community has been optimistically planning for years. General Dynamics employees in St. Louis and at all Data Systems Division locations are helping to make the dream a much-needed reality by donating books to "The Great Chinle Bookout." Collection runs through the end of the year. The books will be shipped in January to the people of Chinle. Information about collection locations will be posted on bulletin boards or published in newsletters. Other divisions may participate as the drive progresses.

General Dynamics' relationship with Chinle began in 1988 when the company sponsored an educational trip for Chinle's junior high school students to the Kennedy Space Center and Epcot Center in Florida. Because they knew of General Dynamics' Navajo facility at Window Rock, Ariz., several teachers wrote the company to ask for a donation to help with expenses for the trip. The group was overwhelmed when General Dynamics came through with the entire \$17,000.

Beth Witt of the Chinle public school system described the community's excitement about the library and appreciation of GD. "We've been dithering around and trying to organize (a library) in our spare time," Witt said. "General Dynamics is really giving us a push to get going."

A trailer from Chinle's federally funded Chapter 1 program will house the library, which will be located in the school district of the reservation. A local school librarian has volunteered to set up the facility and coordinate the staff. Vocational education students will staff the library during the day and adults at night.

Although surrounded by natural beauty, the town does not receive high marks for entertainment. Sylvia Barlow, a junior high school teacher, said that things to do include "going to school or the hospital, doing the family shopping and laundry, or maybe renting a movie and stopping by Taco Bell." Chinle's teachers, many of them teaching couples, view the library as a much-needed outlet and added entertainment. Those with childhood memories of Saturday morning story hours at a neighorhood library are excitedly planning Chinle's youth reading program.



Chinle's school libraries are only open during the school year and are limited in their scope. There are few reference materials for students in junior high and high school. The primary school library is open half-days during the summer, but the children from outlying areas have no transportation into town. The Chinle Library will offer convenient hours and a place where families can spend their leisure and learning time.

Donations will help expand Chinle's horizons beyond its beautiful boundaries of Canyon de Chelly and Monument Valley.

Katherine Kelly

Pomona receives its fourth award for pollution control

OMONA DIVISION HAS been named the first recipient of California's Hazardous Waste Reduction Award for Innovative Technology. The award, the fourth won in a year by the division for pollution control, recognizes the division's initiative and investment in state-of-the-art equipment to eliminate air and water pollution.

The award was presented by the State Health Department to Division General Manager Sterling Starr and the Naval plant facility commander, Capt. Richard Gilbert, at ceremonies before a statewide conference on hazardous waste disposal reduction in Orange, Calif., Nov. 3.

In announcing the award, State Health Director Kenneth Kizer acknowledged the division's "outstanding waste reduction and recycling success story which illustrates the potential for pollution prevention in California." Kizer said the purpose of the new award is to publicly recognize the company for individual efforts to use new technologies to reduce volume and toxicity of hazardous wastes.

Since 1984, Pomona Division, in cooperation with its U.S. Navy customer, has invested in equipment upgrades, changed some of its manufacturing processes and replaced hazardous materials with non-polluting alternatives. These combined efforts have achieved a 96 percent reduction in hazardous waste discharges.

Visitors have a blast at Thornton Quarry

EARLY 10,000 visitors flocked to the small village of Thornton, Ill., south of Chicago recently for a tour of the "Grand Canyon of the South Suburbs."

Material Service Corp.'s Thornton Quarry, one of the world's largest active commercial limestone quarries, opened its gates to the public to show and tell what goes on in its big hole. Although activities were not scheduled until noon, visitors began arriving at 9:15 a.m. in cars with license plates from 25 states.

"You drive by on the Tri-State and wonder what it looks like from the inside," said Martha Grazilis of Markham, Ill. "I've looked forward to this my whole life."

Children received brochures and coloring books, and the entire crowd watched an explosion typical of those set off daily in the quarry that dislodge more than 40,000 tons of limestone in less than three seconds.

The day began at "the overlook," a viewing platform built out of fossiliferous limestone from the quarry. Visitors peered into the site while listening to recorded narration by a creature claiming to have lived there for 400 million years.

Motor coaches took the crowd down a winding 260-foot road to the quarry floor while guides described the extraction and production of limestone. The facility mines more than six million tons of stone a year and makes 35 different products used in construction, shore erosion control, roofing shingles, glass and other activities and materials.

Quarry equipment and fossil exhibits were on display and videos explained blasting techniques.

The explosion capped the day's activities. Vice President-Operations Alan Smith explained what the crowd was about to see and invited onlookers to join in the countdown.

GENERAL DYNAMICS

World

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Company rallies are Charleston employe by Hurricane Hu

HE FLOODS THAT FOLLOWED Hurricane Agnes through Elmira, N.Y., in 1972 submerged the home and nearly everything else that Bess Halloway's mother owned. "We stepped off the roof into a boat," Halloway said. Seventeen years later, Halloway, her husband and two children had just set down roots outside Charleston, S.C., when her Agnes nightmare returned.

During the early morning of Sept. 22, Hurricane Hugo roared through the Fox Fire Mobile Home Park where the Halloways lived. A falling oak tree smashed the Halloways' trailer "like it was stamped flat by somebody's foot," she said. Luckily, the Halloways had moved in with relatives during the storm and no one was hurt. Halloway, who just started work Sept. 1 at Electric Boat's Charleston Facility as a welding

trainee, lost everything. She was not alone. A triple play of natural disasters — Hugo on Sept. 22, four inches of rain two days later and a tornado on Oct. 1 — completely devastated the homes of about a dozen Charleston Facility employees. Nearly all of the complex's 475 workers suffered some personal damages. All told, Hugo hit South Carolina

for \$6 billion in losses and left 70,000 people homeless. More than 25 people were killed in North and South Carolina. Hugo was the worst storm to pound the Carolinas in this century.

The plight of some of the Charleston victims was lightened thanks to General Dynamics and many of its employees. Electric Boat workers at Electro Dynamic, Groton and Quonset donated six truckloads of food and

> clothing for their fellow employees at the Charleston Facility. The company gave \$25,000 to the local Red Cross and provided free fuel, water and ice. The Charleston Facility itself donated the services of 50 employees to help community cleanup and relief.

> The company's relief efforts started almost as soon as the sun rose on Friday, Sept. 22. "Very early that morning we thought where do we go from here," said Dick Gregory, acting general manager of the Charleston Facility. "We decided to do something for the community and the employees. A lot of them live in rural areas with no facilities."

Several crews were assigned to clean up the facility and debris that scattered up to 1½ miles away. "The effort to clean debris site was a major job for our en

By Sunday teams were organ trees off employees' houses and pa for free, a big boost for victims asked to pay as much as \$1,00 ting and removal by disaster pro I remember most was a house w on the same softball team with mett, a fabrication working lead one of the teams. "We took a tr side of the house. They were ex and, like me, couldn't afford it. commodity at that time, but the they gave the cleanup crew some

Crews also helped the Chai loading, unloading and driving re off power lines and redirecting son other Electric Boat plants to chu bution. In one instance, a crew elderly that had been flooded. "T Tissot, Charleston Facility nurse guys were there three days shove

Foreman John Benner, who d helped within a week. General D day.

The worst case Benner observe damage only to have its chimne makes you feel bad to see all the you help them and see them so h

Literally tons of help also cam A call for assistance netted mor food, diapers and trash bags. En The first truckload arrived at the aid developed into such a flood goods before distribution. More

Those 300 included Halloway rebuild their lives. "The distribut what you needed," she said. "I w help has been



Diminishing a disaster

Mel Cramer, a member of a Charleston

▲ Bess Halloway is one of about a dozen Charleston employees who lost everything in Hurricane Hugo. A tree fell and smashed the trailer where Halloway, her husband and two children lived. No one was hurt; Halloway and her family had moved in with relatives during the storm.

Torrential rains in Groton, Conn., didn't stop Electric Boat employees from donating goods to fellow employees in Charleston, S.C., who suffered losses in Hurricane Hugo. Electric Boat workers at Electro Dynamic in Avenel, N.J., and the Quonset Facility in North Kingstown, R.I., also pitched in to the relief effort. Employees at the three locations sent six truckloads of food and clothing to Charleston.



around yees hit

lugo

an debris off our 98-acre or our employees," Gregory

ses and patch their roofs victims who had been as \$1,000 for tree cutaster profiteers. "The one house where an employee was am with me," said Chris Hamking leader who participated on took a tremendous tree off the were expecting to pay for that afford it. Water was a precious by, but they were so overwhelmed they some to drink."

the Charleston community by driving relief trucks, taking trees ecting some donated goods from its to churches for public distri-, a crew cleaned a home for the

booded. "The mud was knee-deep in there after the storm," said Nancy ity nurse whose husband, John, is an administrator at the home. "Our sys shoveling it out and ripping out the carpets."

er, who directed the crews, estimated that at least 70 families had been eneral Dynamics picked up the crew members' wages of about \$3,600 a

er observed was the home of an employee that escaped Hugo with little s chimney driven through the roof by the tornado a week later. "It see all the people down and out," Benner said. "But you feel better after

also came to Charleston employees from other Electric Boat locations. tted money and such critically needed commodities as clothes, baby bags. Employees from Groton and Quonset even donated chain saws. ved at the Charleston Facility three days after the hurricane, and the a a flood that those at the site soon gave up trying to categorize the on. More than 300 employees eventually picked up clothes or food.

Halloway, who has moved her family into an apartment while they distribution was right here in front of the facility — you just took away aid. "I was given food and clothes and they put me back to work. The as been just fantastic."



▲ The rear end of the Charleston Facility's 200-foot-tall Final Assembly Building took the full force of Hurricane Hugo's 138-mph winds. The storm punched several visible holes. Debris from the hurricane is piled in the foreground of the photo.

Hugo knocks plant down, but not out

Moments after Hurricane Hugo and its 138-mph winds had blown through Electric Boat's Charleston S.C., Facility on Sept. 22, Acting General Manager Dick Gregory said, "Let's go put this place back together."

The enormity of that task didn't become apparent until dawn. The light revealed battlefieldlike devastation to Gregory and three volunteers who stayed at the site when Hugo hit shortly after midnight. Only rubble remained of two classrooms. A small pump

house and a first-aid trailer had disappeared. The buildings still standing had been punched full of holes. Anyone doubting the storm's fury had only to see the 200-foot-high Final Assembly Building where hull sections are completed for submarines: A

175-foot-high door had been hurled to the ground. The administration building where the volunteers stayed earlier in the night

was rendered virtually unusable; luckily, the four left for sturdier shelter shortly before the ceiling collapsed.

"The No. 1 question asked by our team members was are we still in business," said Barney Clarey, one of the volunteers.

Anyone who saw the facility that morning had their doubts. The possibility was very real that the complex's 475 employees, who had all suffered personal losses of varying degrees from the hurricane, might also lose their jobs.

Gregory was determined that wouldn't happen. "We can provide food and all kinds of other relief, but the big concern is getting the jobs back," he said. "These people need their weekly paychecks."

Cleanup and repairs began that morning, and 30 employees resumed limited production three days

later. By Oct. 3, 400 people had been called back to work. Not a payday was missed, and \$33,000-was on hand to cash checks for employees who couldn't reach their banks. Despite damage estimated in excess of \$5 million, "I don't foresee any significant slip in our production and I don't see that we can't recover," Gregory said.

Prudent measures taken before the storm prevented any injuries and limited damage. All employees except maintenance workers went home at 11 a.m. on Sept. 21. A thousand sandbags were filled and placed. The volunteers who stayed during the hurricane ensured that power would be available the next day by keeping transformers dry, a key effort to the facility's rapid recovery because the local utility company would have needed two to four weeks to restore electricity.

Teams from Electric Boat's Groton and Quonset locations flew to the Charleston Facility the next day to help recovery work. Gregory concentrated efforts on the facility's two largest buildings, the subassembly and final assembly sites. "The Subassembly Building was reparable in a hurry, so we wanted to close that up so the employees could work safely from the monsoons we get here," Gregory said. "We wanted to clear the debris from the Final Assembly Building and make it safe to work in."

That last task will take some time. Safety netting had to be hung first before the roof on the Final Assembly Building could be fixed and employees could work safely. Roof repairs will require two to four months.

In the meantime, the Charleston Facility won't be idle. "By Sept. 29, we were pretty much back in shape and I was screaming at Quonset for production material," Gregory said.

It's business as usual at the Charleston Facility, weather or not.

Dave Lange

0 0 0

Puerto Ricans call on Pomona for relief

Hurricane Hugo first touched American territory on the island of Vieques, 12 miles south of Puerto Rico. Winds up to 145 mph battered the island for 14 hours.

The only structures left livable were a few reinforced cement houses. No one was killed, but islanders, including those working for Sparatec, Inc., a vendor of the Pomona Division,

were without shelter, food, water, clothing and electricity. Uprooted giant trees blocked roads. Air transportation between Puerto Rico and Vieques was disrupted; commuter planes were flipped over and other grounded aircraft were blown inland and wrapped around

Sparatec President Robert Friezo and Lila Mayoral Hernandez, wife of the governor of Puerto Rico, asked Pomona Division to help. Employees responded with 7,000 pounds of food and clothing and \$2,680, matched by

General Dynamics, to an appeal sponsored by the communications department, the National Management Association Pomona Chapter, the Pomona Con-Trib Club and union locals. The two-day drive was extended to three at employees' request.

"The reaction was more than anyone expected," said Donald Spears, subcontract administrator and liaison to Sparatec who helped organize the collection. "People went all out. They brought in things like large canned hams and new clothing that didn't come off a shelf at home. People were totally responsive."

Added Stephen Hawkins, management association community services manager: "People's only concern was to help and to get the material to Vieques as soon as possible. There was one person from field

services who donated cases of food. I was there when he unloaded the trunk of his car, and when I thanked him, he was embarrassed. He didn't want any recognition. He only wanted to help."

The transportation department packed the donations and the shipping department acted to get the

goods to Vieques quickly. "We repacked everything, including jars of baby food," Shipping Supervisor Frank Darrow said. "The regional vice president of Emery Worldwide Air Freight got involved and personally confirmed priority shipment to San Juan."

Communications Director Daniel J. Luchsinger met the shipment in San Juan and contacted Rear Adm. John Moriarity, commander of U.S. Navy Activities Caribbean, who directed military assistance for hurricane relief. The admiral dispatched two helicopters that took the relief supplies to the centrally located Sparatec plant, where

people from throughout the island came for goods.

Pomona also helped Sparatec employees return to work. Property Management Manager Barney Belant and his group located a General Dynamics surplus 55 kilowatt generator for loan to Sparatec so the company would have electricity to resume operation. The Navy rewired the generator to local requirements.

"I only wish everyone who gave to this relief effort could have been on Vieques to see how the people there needed their donations and appreciated their generosity," Luchsinger said. "There was a boy sorting through clothing who wore a new T-shirt that said 'Standard Missile' in bright red lettering. I saw a little girl clutching a small, brown teddy bear donated by someone who remembered children need something soft to cuddle."





A Puerto Rican boy wearing a new Standard Missile T-shirt donated by Pomona Division looks through clothing sent by Pomona employees.

NASP budget is uncertain; company commitment is not

ENERAL DYNAMICS is committed to play an active role in the National Aero-Space Plane no matter what budgetary level the program reaches, President and Chief Operating Officer Herbert F. Rogers recently told Fort Worth employees working on the program.

"As all of you know, NASP is at a very important crossroads within the U.S. government, the Department of Defense, NASA and General Dynamics," he said. "The primary reason is budgetary constraints within the Defense Department and NASA.

"I'm convinced that the government will continue to fund a NASP effort to some level. We don't know yet what that level will be, but General Dynamics will be an active player no matter what they do.

"General Dynamics has staked out hypersonic flight as a future of aerospace. We have several divisions that will be very involved in hypersonic flight in the future."

Hypersonic flight occurs at speeds greater than Mach 5, or five times the speed of sound. The National Aero-Space Plane, called the X-30, is to be capable of orbital flight and flight within the atmosphere at speeds approaching Mach 25. Convair, Fort Worth, Space Systems and Pomona are divisions involved in hypersonic flight, Rogers said.

Rogers also praised the progress the X-30 team has made in researching the program. "Today we have many people who are among the world's best in the field of hypersonic flight, which puts us in an excellent competitive position," he said. "We have made dramatic strides in the last four years. The future will be even more exciting as we go further and eventually apply what we've learned to vehicles."

Tank sale would send 315 M1 A2s to Saudis beginning in 1993

Saudi Arabia has requested to purchase 315 M1A2 Abrams tanks from the United States government. Deliveries would be over three years beginning in 1993.

The M1A2 (Block II upgrade) is the second major improvement to the Abrams program. Production of the M1A2 is scheduled to begin in late 1992. The upgrades will improve the tank's lethality, protection and crew survivability.

The Bush administration informally notified Congress Oct. 11 of the Saudis' intended purchase. Formal notification is expected in early November after which Congress has 30 days to block the sale. If majorities in the Senate and House oppose it, President Bush would have the option of vetoing a blockage. Congress would need a two-thirds vote in the House and Senate to override a veto.

The outright sale of fully assembled tanks with no coassembly or coproduction would have significant economic and employment impact for the United States, generating over \$1.8 billion of direct and indirect hours and approximately 57,000 man-years of work.

The sale is a significant step toward maintaining annual tank production of at least 576 units at Land Systems, the minimum level necessary for economic operation of two plants. The Saudi purchase could also position General Dynamics well for sales to other countries.

Self-propelled gun sought

Land Systems Division has teamed with Britain's Vickers Shipbuilding and Engineering Ltd. to compete for a contract to build an Army self-propelled artillery gun.

The contract is for 3,500 vehicles with a potential value of \$7 billion.

Vickers and Land Systems combine similar expertise. Land Systems builds the M1 Abrams tank for the Army, and Vickers was recently awarded a contract to produce a self-propelled howitzer for the British army.



The first F-16A for the Indonesian air force cruises over northern Texas on an acceptance flight.

Indonesia receives its first F-16

WO RENOWNED BIRDS of prey, the Fighting Falcon and the legendary Indonesian Garuda, or war eagle, joined forces on Oct. 20 when the air force of the Republic of Indonesia received its first F-16 in ceremonies at Fort Worth.

Lt. Gen. I.B. Sudjana, secretary general of Indonesia's ministry of defense and security, accepted the aircraft. It is the first of 12 single-seat F-16As and two-seat F-16Bs ordered by Indonesia in 1986.

Abdul Rachman Ramly, Indonesia's ambassador to the United States, and other Indonesian government and military officials were also present.

On hand from the U.S. government were Rep. Pete Geren of Texas; Paul D. Wolfowitz, undersecretary of defense for policy; and John Cameron Monjo, ambassador to Indonesia. Maj. Gen. Eugene H. Fischer, assistant deputy chief of staff for programs and resources, and Brig. Gen. Ralph H. Graham, F-16 program director at the Aeronautical Systems Division, Wright-Patterson Air Force Base, Ohio, represented the U.S. Air Force.

Herbert F. Rogers, president and chief operating officer, was the principal General Dynamics representative.

The aircraft papers were transferred to Sudjana before an audience that included more than 60 members of Indonesia's air force who are receiving F-16 flight or maintenance training in the United States.

Steve Barter, Fort Worth's chief test pilot, flew the first Indonesian F-16A in a high performance aerial demonstration at the close of the ceremony. The first F-16B, a two-place model, was on display with a colorful and fearsome-looking statue of the Garuda.

Indonesia is the 15th nation worldwide and the third in Southeast Asia to receive the F-16. The Indonesian aircraft incorporate some of the newest improvements to the Fighting Falcon, including the F-16A/B Operational Capabilities Upgrade and the improved Pratt & Whitney F100-PW-220 engine.

Sudjana remarked that the F-16 will play an important part in the modernization of Indonesia's air force, reinforcing its policy of increasing strength through continuous enhancement of capabilities.

Geren described the F-16 as "the world's finest combat-proven aircraft."

Said Rogers, "We are proud that we are helping to strengthen a nation that is an important ally and friend to the United States."

■ Joe Stout

Mine teams ready to come to rescue

REEMAN United Coal Mining Co. rescue teams have been busy these days. Fortunately, their active schedules haven't come during life-threatening situations but in competitions against teams from other coalmining companies.

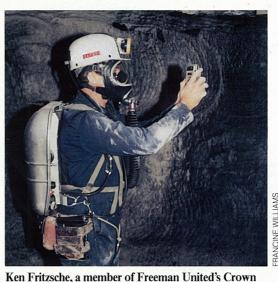
Freeman has developed two highly skilled eight-man mine rescue teams over the last few years, one for the Crown Mine Complex in central Illinois and the other in the Orient Mine area in southern Illinois. The teams are composed of union and salaried employees.

"The primary responsibility of the mine rescue team is to

be prepared to protect the lives of our miners and our property in the event of a major fire or explosion," said Thomas Austin, Freeman's director of safety. "As a means of achieving that goal, our teams rigorously train both underground and on the surface."

The primary test of their skills has been in competition. The events help the teams learn from mistakes without endangering lives.

Freeman teams began competing against other coalmining companies throughout the United States five years ago. After a number of "learning experiences," they have won several contests and have placed highly in others.



Mine Complex rescue team, takes a measurement.

"The competition is part of our training," Austin said. "Hopefully they'll never have to use it. But it is like fire-fighters simulating a fire so they can test their readiness. Also, someday we may be working with some of the other teams in the competition during a real disaster. This helps us get acquainted with their techniques."

The teams are tested on their skills in underground ventilation, mine gases, mine rescue rules and recovery procedures. A simulated underground mine on the surface is used to develop and practice those skills.

The teams are subjected to problems that may take up to two hours to complete, testing stamina, ability to operate under pressure and overall mine knowledge. Scores are based on how well and quickly problems are solved.

Making up the Crown team are Gary Smith, Ken Fox, Ken Fritzsche, Ron Awbrey, Ken Champley, Chuck VanAusdall, Lee Garrison and Dave Stephens. Orient team members are Dave Weaver, Barry McCauley, Bill Duff, Walt Swallers, Charles Dame, Bill Devine, Mark Malkovich and Terry Engram. Austin and Joe Gladson serve as trainers.

General Dynamics team helps law patrol U.S. border

T WAS A HOT, MUGGY DAY in July when the Department of Justice called on General Dynamics to turn up the heat on smugglers and illegal aliens. The department needed help with "Operation Alliance," a program to halt the flow of illegal aliens, drugs, firearms and other contraband across the Mexican-U.S. border.

"They wanted to know if we'd provide support," said Guy Woodard, assistant project engineer for low intensity conflict systems at Fort Worth Division. "The Army pilots who normally would have been tasked to

do the mission were on another

assignment."

The Army had been leasing a Cessna U-27 Caravan surveillance system as part of a sensor evaluation program.

Woodard and his staff agreed to surveillance duty with the Cessna Caravan equipped with a Fort Worth Division multisensor pod with crew-operated sensor controls, recorders and communication equipment. Thus began a two-week, multidivision exercise with the border patrol that included Fort Worth personnel, Cessna pilots and General Dynamics Services Co. logistical support employees.

"We felt it was an excellent opportunity to evaluate our surveillance system in a real oper-

ational environment and also to make some marketing points," Woodard said.

It turned out to be a mission that will be remembered for its help to the government, the benefits to the company and the excitement for those involved.

"There was a broad range of agencies that we were able to perform before in this operational demonstration," said Mark Blair, Caravan sales manager-fleet/ government at Cessna. "And we have reason to believe that there was only positive reaction that came from this demonstration."

The operation began in July. The General Dynamics team made its mark by tracking down illegal drug

The team consisted of Woodard and M.L. "Mick" MacDonald in the Tactical Operations Center, pilots Carl Rivers and Charles (Butch) Seitz, systems operator Leroy Hoffee and mission coordinator Kenneth Henson. They participated in about 20 different reconnaissance missions, making middle-of-the-night flights at 3,000 feet using infrared systems and satellite com-

"We were never in any danger. The aircraft flew at altitudes high enough to avoid sound detection," Woodard said. "We were able to provide the infrared film documentation on several drug interdictions (arrests made) across the Rio Grande. The border patrol took over from there. There were 31 significant incidents and we participated in six.



The Cessna U-27 Caravan, carrying a multisensor pod under the fuselage, used its night eyes to see illegal traffic crossing the Mexican-U.S. border.

"It was very, very hot and humid at the time. It was between 11 p.m. and 4 a.m. and it was pitch black out there. You couldn't see anything. It was nighttime and it was still about 90 degrees."

The operations occurred over rugged and sparsely populated terrain. The crew used night-vision goggles and infrared cameras with electro-optical lenses. The equipment was so sophisticated that when flares were dropped, the crew could "pick out jackrabbits" from 3,000 feet in the air.

Although federal law enforcement agencies have made no decision, both Woodard and Blair say the operation helped market the low intensity conflict

"We've been courting this market for more than two years," he said. "We've had more than 100 demonstrations and we're just now beginning to reap the benefits. We were able to expose the system to virtually every target agency. This operation gave our potential customers a better understanding about how to utilize our aircraft and the reconnaissance system on it."

Added Woodard: "I can't say enough about the excellent job that Seitz, Hoffee, Henson and Rivers did. They ran a high-class operation. This was truly a multidivisional operation that could pay off for General Dynamics in the very near future." ■ Myron Holtzman

Matching gifts program changes

The company's matching gifts program has incorporated a number of changes effective immedi-

- General Dynamics will match gifts of \$50 or more. The previous minimum, \$25, had been in effect since the program began in 1975. The maximum total of an employee's donations per calendar year that will be matched will remain \$5,000.
- Retirees with 10 years' service are eligible to participate.
- Donations to public television and radio will be matched.
- Donations to historical societies, preservation groups and conservation organizations will be matched.
- The length of employee service required for eligibility has been cut to six months.
- Matching gifts will be made to non-profit organizations with foreign operations but U.S. headquarters and a 501(c)3 status with the Internal Revenue Service.
- No gifts to secondary schools will be matched.
- No gifts of stock will be matched.
- Walkathons and similar charitable events will not be eligible for matching gifts.
- Hospitals are excluded from matching gifts. However, donations to medical research will continue to be matched.

Making the program more responsive to employees' preferences is the main reason for the changes, according to Winston C. Gifford, corporate director-contributions. "For example, many people had asked for inclusion of public TV," Gifford said. "The changes also reflect research of what other corporations are doing in terms of matching gift program administration. It puts us more into the mainstream of how such programs are administered elsewhere among Fortune 500 companies."

New matching gift forms containing these changes are available from local program administrators. Employees must complete the forms and conform with the program's guidelines to make gifts that the company will match. Copies of the old form should be destroyed.



WE HAVE LIFTOFF. Atlas-Centaur mission AC-68 lifts off at Cape Canaveral, its reflection caught in a nearby lake, on Sept. 25. The blastoff came at facilities recently refurbished by General Dynamics Services Co. The Atlas launch was the last for NASA. Space Systems Division plans its first commercial Atlas launch in June. Space Systems has firm commercial commitments for 20 launches and the Air Force has 11 launches planned on Atlas. The latest Atlas order came on Oct. 17 from the International Telecommunications Satellite Organization to launch an INTELSAT K communications satellite in late 1991.

Savings and Stock Investment Plans

Annual Rate of Return for the

12 Month Period Ending:				
Sept. 1989				
8.5%				
34.5%				
10.4%				
8.6%				
35.4%				
10.4%				
\$58.12				

Flight simulation the next best thing to being there

ATIONAL GEOGRAPHIC Magazine referred to Fort Worth's Flight Simulation Facility as one of the best in the world. Although the simulators were designed to support the development of new aircraft capabilities, their realism has led the U.S. Air Force to consider them as an operations training tool. The following describes a demonstration conducted in September.

Ten F-16 pilots from Air Force bases in the United States and Europe gather in a conference room at Fort Worth's Flight Simulation Facility. They are accompanied by training experts from the Tactical Air Command and the Air Force's Human Resources Laboratory, who will evaluate their performance in a new training concept.

The experts will judge the value of high fidelity simulators for combat training. The Air Force's previous use of simulators has mainly been for safety, instrument and emergency training.

Most fighter pilots have an instinctive grudge against anything less than real flying. However, costs and other factors are causing the Air Force to consider simulation as a potential tactical training aid.

Fort Worth employee Jack Ivy begins the exercise by describing a battle scenario.

A few hours later, a pilot from the 401st Tactical Fighter Wing, Torrejon Air Base, Spain, is engaged in an intense battle being projected on the concave inner wall of a 24-foot simulator dome. As wingman, he supports his lead pilot, who is fighting the same battle from another simulator down the hall.

The lead aircraft appears as a tiny dot far ahead of him in the blue sky. In a minute, the horizon swings to the right as he makes a hard left roll to pursue an enemy. One adversary passes him head-on, appearing in detail only for an instant as it goes by in a blur.

Another aircraft appears as an oscillating dot. But on the radar scope inside the cockpit, it's a bogey. There's a red flash

as the F-16 pilot fires an AIM-9 missile. A bright streak appears in the blue sky, moving away from the cockpit in a graceful arc. It meets the enemy aircraft in a flash of fire.

General Dynamics' Ivy and Herb Bell from the Human Resources Laboratory, Williams Air Force Base, Ariz., are watching the battle on screens in the observation room that shows much of what the pilots are seeing. Speakers carry the pilots' communications.

The room also has something the pilots can't see: an overall display showing the positions of the two "friendly" aircraft, the approaching flights of red enemy aircraft, and the locations of hostile surface-to-air missile sites.

Ivy, playing the part of ground controller, uses a microphone to speak to the pilots:

"Hammer One has bogies on the nose, high altitude, low aspect...further bogies to the west, heads up, high

"General Dynamics is the only place that can provide multiship, multithreat air-to-ground simulation."

- Maj. Ron Garhart



One of Fort Worth's F-16 simulators (inset) displays a pilot's-eye view of a two-aircraft mission. The photo shows the real thing from a wing-mounted camera.

aspect...showing bogies to the west-northwest, 5,000 feet. "Break right! Chaff! (The head-up display screen for

the lead aircraft rolls rapidly, then flashes red.)
"You're dead, Hammer One."

Later, the pilots, Capts. Bill Becker and Kenneth Rosson, are in a debriefing room at the laboratory, watching videotapes from the mission. They see what Ivy and Bell saw earlier in the display room, including the large screen showing the overall scenario.

"The ground training devices of today are excellent for ground and safety training, but they have little value for mission training," said Maj. Ron Garhart, who is responsible for new training systems at Tactical Air Command Headquarters, Langley Air Force Base, Va. "We're conducting this demonstration to see if high fidelity training devices can help solve current problems and guide us as

we determine training requirements for future systems. In the past, we've always bought the jet first and thought about training later.

"We're going to have to do things differently with the new aircraft that will be coming on line soon, like the Advanced Tactical Fighter and the Advanced Tactical Aircraft (A-12)."

Field training is hampered by such factors as peacetime rules, security restrictions and technical constraints. Political and environmental considerations, such as the sentiment against low-altitude fighter operations in Western Europe, are beginning to influence training operations.

The recent TAC demonstration was the second con-

ducted at Fort Worth. Garhart said the Air Force has conducted similar exercises with F-15 simulators at McDonnell Douglas in St. Louis in a program for airto-air combat training. "Since the F-16 is a multirole fighter, there are a lot more facets to an F-16 mission and the simulation task is much more difficult," he said. "Right now, General Dynamics is the only place we have that can provide multiship, multithreat air-to-ground simulation."

Garhart and Bell emphasized that the Air Force has no plans of replacing actual flying time with simulators.

Bob Lee, Fort Worth's director of electronic systems and laboratories, said the simulator combat training concept fits well with the company's involvement in advanced aircraft development and the lines of business being pursued by the new Flight Training Systems Division.

Fort Worth's simulation facility has played an important role in the F-16's evolution. The 70,000-square-foot laboratory has 13 simulation stations and is used as an engineering tool for the F-16, A-12, Advanced Tactical Fighter and National Aero-Space Plane programs. Its newest equipment uses three projectors to provide visual

scenes for a 360-degree field of view inside a 24-foot dome. There are also two 40-foot domes.

"The potential is there to give some good training because we were able to do some things that we usually don't get to try," pilot Rosson said. "You try to think like you would in a real airplane. The concept has a ways to go, though, to be as useful as it could be."

Said Becker: "This forces you to push the right buttons, which is good. It'll never replace real stuff, but it's nice to be able to work in a multithreat environment, using chaff, flares and electronic countermeasures and receiving feedback so you'll know whether you're doing the right thing. Your adrenalin goes up and you sweat.

"This is the best simulator that I've ever seen. We don't have anything close to it."

Numbers Game: General Dynamics employment as of July 31

AMSEA		220	Electric Boat Division		23,939	Pomona Division		7,461
Cessna		4,119	Avenel	395		Camden	1,423	
Convair Division		8,207	Charleston	437		Navajo	302	
Corporate Office		492	Quonset Point	5,216		- Resources		3,475
St. Louis-Headquarters	283		Electronics Division		3,045	Darlington Brick	76	
Non-St. Louis-Headquarters Staff	105		Fort Worth Division		29,602	El Paso	208	
Government Relations (Washington)	60		Abilene	895		Freeman United	1,006	
Field Offices	32		Laser Systems Division		50	Marblehead Lime	341	
International/Domestic	12		General Dynamics Services Company	LUZ IB	1,471	Material Service	1,755	
Data Systems Division		4,622	Harlingen	349		Powell & Minnock	89	
Central Center	1,903		International/Foreign	Superport U.S.	38	Space Systems Division		4,702
Eastern Center	890		Land Systems Division		6,316	Canaveral	401	
Pomona/Valley Systems	396		Detroit	3,450		Commercial Launch	35	
Western Center	1,376	(20 F)	Lima	2,372	in the	Vandenberg	178	
St. Louis-Home Office	57	77	Scranton	459	METER	Valley Systems Division		3,503
	AN 1/2-11 COLUMN 1	STATE OF THE PARTY				Total Corporation		101,262

Season's greetings

EACE ON EARTH.

This year, it has a more meaningful ring to it.

All the world has reason to be thankful for the events that are unfolding in Eastern Europe — and for the cracks beginning to appear in other walls that restrict human rights.

Since the whole concept of a strong national defense is to achieve and maintain the peace through deterrence, it's fair to say that such a posture has helped to achieve these remarkable changes. It can even be said that each of us, in our own way, contributed to this refreshing and long-awaited outbreak of peace.

Whatever adverse effects, if any, all of this might ultimately have on our business, the trade-off is obviously more than welcome. Others, many for the first time, will have an opportunity to enjoy some of the freedoms and economic benefits of a system like ours.

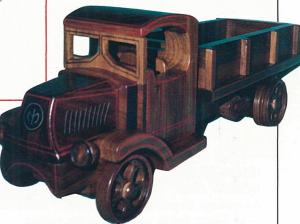
While our business is often unpredictable, we're all very fortunate to work within a political system that guarantees us the rights denied to so many others. That's something we should all consider as we enter this holiday season.

To each of you and to your families, I wish you well and thank you for your individual efforts during the past year. I hope that 1990 will be a good year for each of you.

Stanley C. Pace
Chairman and Chief Executive Officer

■ Santa Tex. Tex Porter, a design specialist at Pomona Division, plays Santa Claus for children of employees at their annual Christmas party — as he's done for the last 30 years. The Porter family has a strong General Dynamics tradition. Tex has been with the company for 38 years, and his wife and her father and grandfather have also worked at General Dynamics.

▼ Christmas special. A child in Georgia will receive this wood model of a 1926 Mack truck, built by Electric Boat engineering supervisor Robert W. Sanders. Sanders' model won a grand prize in a toy-design contest sponsored by Wood Magazine. Sanders' model and 425 other entries will be donated at Christmas to children in states where the entrants live through the Marine Corps' Toys for Tots program. Sanders works in a site office in Kings Bay, Ga.



GENERAL DYNAMICS

World

Volume 19 Number 12

December 1989

Company is prepared to ride out defense downturn, Rogers says

HE COMPANY HAS ANALYZED its business environment, defined its strategy and made its commitments. Now, with the expectancy of a reduced defense budget and the potential for some new, dramatic geopolitical events unfolding that could cut back or cancel some military programs, that strategy gives the company a strong business base as it moves into the '90s.

That's the message delivered by President and Chief Operating Officer Herb Rogers in several wide-ranging interviews with national news media during the past few weeks. Following are some selected topical comments by Rogers on how the company and industry might be affected by recent fast-moving economic and political developments here and overseas.

DEFENSE BUDGET

"I don't think the downturn is going to be as dramatic or devastating as it is currently rumored to be. For example, taking \$180 billion over five years from the original projected budget would result in a decline from approximately \$300 billion to \$260 billion at the end of 1995. It is a pretty significant cut, but in my view, it

(Continued on Page 7)

Photo contest's best culled from 715 entries

HERE WERE 88 BABIES AND CHILDREN, 56 sunrises/sunsets, 44 flowers (mostly roses), 23 mountains and nine lighthouses. Plus assorted race cars, ships, balloons, hang gliders, trains, planes and a pickup truck.

There was the birthplace of John Quincy Adams, the Mosque of Sultan Ahmet, the Statue of Liberty and the Eiffel Tower. And there was a high-gloss, four-color

First calendar insert inside

menagerie of 29 birds, 25 dogs, 24 cats, seven horses, four deer, three bears (of course), tigers and turtles, kangaroos and camels, a tree frog, dolphin, ocelot, meerkat, two cows and much more.

Some 715 entries made it to the starting line in the first corporatewide photo contest, which concluded Nov. 6 with all-day judging behind locked doors in St. Louis. When the last vote of the seven judges was tallied, 12 first-place winners—representing seven GD divisions—had been selected, as well as 36 runners-up.

From an "at bat" perspective, photographers from Space Systems were tops among the 48 winners with 10 of their 62 divisional entries receiving awards. Close behind were Freeman United Coal, one of seven entries a winner, and Land Systems, with eight winners from among 78 submitted. Following were corporate head-quarters, one for 12, and Fort Worth, with 13 for 175. Fort Worth accounted for 25% of the total entries.

What was the overall quality of the 715 photos submitted? "Fantastic!" according to all seven judges, who agreed that there were many "absolutely first-class" pictures in addition to those receiving awards. "It was like trying to choose from a room full of \$100 bills," a judge said.

The judges were Bob Morris, corporate vice president -communications; Pete Connolly, corporate director-public affairs; Dave Lange, corporate manager-internal communications; Tom Rule, corporate graphics project administrator; and division photographers Bill Mitchell of Valley Systems, Milt St. Onge of Land Systems and Tim Whitehouse of Convair.

(Continued on Page 4)

News Briefs



A Cessna Caravan flown by Federal Express.

Federal Express orders 50 Caravans

Cessna Aircraft Co. will build 50 more Caravan I turboprop cargo aircraft under an order from Federal Express Corp. announced Nov. 17. The order includes an option for 100 more Caravan Is.

Federal Express has already received 173 Caravan Is. Cessna will deliver 27 more under the current contract.

The Caravan I is the only single-engine aircraft authorized by the U.S. Postal Service to carry

Deliveries of the newly ordered Caravans will start in September 1990 and continue through January 1992. Exercise of the 100-plane option would extend deliveries through October 1994.

Valley Systems teams up

Valley Systems Division is one of eight enterprises that are pooling their talents to develop the 155mm Autonomous Precision Guided Munition, an artillery shell that can search for and destroy targets

The eight have formed a consortium to work on the project. Besides Valley Systems, the members are Aselsan of Turkey, Computing Devices Co. of Canada, Dornier of West Germany, ENSAB of Spain, MATRA of France, Oto Melara of Italy and Signaal of the Netherlands. Valley Systems is responsible for overall systems engineering and development of the weapon's dual mode millimeter wave seeker.

Development has begun under a \$78 million contract from the Army.



Someone's watching

THE RECENT REPORT of a visit by aliens to the Soviet Union has rekindled speculation on everybody's favorite topic: UFOs.

Further fueling the fire is "Above Top Secret," a new book by extraterrestrial researcher Timothy Good about reported flying saucer visits to all corners of the earth since 1943. Reviewer Dave Shiflett, writing in The Wall Street Journal, calls this a "bible for UFO watchers," cautioning readers that "you will just have to make your own decision about such sightings."

Easier said than done, when one considers the thousands of such reports - many "documented" by author Good. Several describe encounters with 4-foot-high, large-headed, web-footed humanoids or 3-foot, lipless, earless, noseless visitors.

Still another account portrays aliens as "between 20 and 25 years old, very young, pert, energetic and intelligent-looking... with sharp chins and noses...all in two-piece suits." (Presumably, not too much unlike what one might meet on Wall Street these days.)

Good's book examines sightings from Beijing to Finland to Mansfield, Ohio. Then, on page 292, things warm up. A former Air Force officer now teaching at the University of Wisconsin describes how a UFO destroyed an Atlas F missile following its launch from Vandenberg Air Force Base on Sept. 15, 1964. That's right, an Atlas

Says Robert Jacobs: "Suddenly we saw a UFO swim into the picture. It flew right up to our missile and emitted a vivid flash of light...then a second vivid flash of light...then two more... and then it vanished. A few seconds later, the missile was malfunctioning and tumbling out of control."

Our own check of the facts tells a somewhat different — but still interesting — story. On Sept. 15, 1964, an Atlas D successfully launched an Advanced Ballistic Re-entry System payload. Missile performance was perfect and, as designed, the vehicle fell to the earth following separation at the correct altitude. The spacecraft carrying the payload continued at the proper heading and speed. Suddenly, however, all contact was, inexplicably, lost. An official debriefing several days later, with review of tracking data, indicated only that an unidentified object was detected by telemetry "traveling at an extremely high velocity" and impacting the spacecraft. No trace of the payload was ever found.

Now, 25 years and several thousand sightings later, Tass reports 10-foot-high, glow-in-the-dark aliens disembarking in a Soviet park. Unfortunately for the visitors, their timing was terrible. The World Series, an earthquake and the threat of the Soviet government to tax vodka, beer and caviar pushed their arrival almost completely off the front pages. And that's how the other aerospace industry is faring these days.

GENERAL DYNAMICS

Published by: General Dynamics Corporation Pierre Laclede Center, St. Louis, Mo. 63105

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President and Chief Operating Officer Herb Rogers addresses the recent decision mapping session at the Corporate Office. At Rogers' table are Dave Wheaton (right), corporate vice president-program development and planning, and Charles MacNelly, Fort Worth human resources specialist.

Company 'maps' out strategic course

ECISIONS, DECISIONS. Division general managers have many to make. Perhaps the toughest: which of many promising business opportunities to pursue with limited resources.

How to make those choices is the topic of the decision mapping process. President and Chief Operating Officer Herbert F. Rogers and Corporate Vice President-Program Development and Planning David J. Wheaton endorsed the process at a recent Corporate Office training session for decision mapping.

"Each division has more good opportunities to pursue than money and resources available," Rogers said. "Generally, we try to pursue too many things at once. This is not totally wrong because a lot of programs never fully develop. However, we need to use decision mapping as a process to help us focus on the things that are most important to the division and the corpora-

Chairman and Chief Executive Officer Stanley C. Pace has also emphasized the corporation's commitment to use this process for decisions affecting internal and external matters.

Decision mapping is a management tool, not a training program, to apply maximum resources to company strategies and to keep strategies focused on the customer. The process is a key element to strengthen the company and maximize profits in a changing defense environment.

Sid J. Ward, human resources development manager at Valley Systems, and Charles E. MacNelly, human resources specialist at Fort Worth, conducted the training session. They designed materials to use decision mapping at the divisions.

Representatives from each major division who serve as decision mapping coaches and instructors attended the Corporate Office session to learn about training materials and implementation plans for the process. About 480 employees corporatewide have participated in the program since it was introduced to the company by Managing Process, Inc., of Cincinnati in May 1988.

Results are in; presentations are next

(This is the first column on the results of the Survey the Stanford Achievement test or any other achieveof Employees by Naomi Morales, cor-

poratewide survey manager.)

The administration phase of the second Survey of Employees has been completed. A special thankyou goes to those who took the time to offer their honest ideas and suggestions.

Almost 58,000 employees throughout the corporation took the survey, closely matching the participation rate of the first survey in 1986.

Many employees noted that the questions in this survey were more focused and easier to understand than in the 1986 survey. In addition, employees at all locations frequently wrote about suggestions, concerns and problem areas. These factors will improve feedback, planning and action.

A number of questions were received about the accuracy of the data processing. To understand how the process works, I recently visited Psychological Corp., a San Antonio-based company that has been contracted to process the completed questionnaires and provide the survey consultants, Sirota, Alper and Pfau, with the results.

Those who have taken a college entrance exam,

ment/skills test have probably taken a test that was prepared and data-

scanned by Psychological Corp.

This company claims a 99.99% accuracy in its operations. At every step in the data-scanning process, the staff is attuned to quality and accuracy. As one man in the receiving department said, "When I get a survey from someone, I know their ideas are really important. So I make sure it gets to the right place for the next

step in our work. Sometimes the surveys come in boxes of several hundred and sometimes they come in single envelopes. I know all of them are just as important."

Psychological Corp. finished processing all General Dynamics surveys on Nov. 11. Within one week, the company had prepared the computer tape for all results. The tape was sent directly to Sirota, Alper and Pfau, which is preparing the corporate and division results for presentations in January and February.

Your division survey manager will be preparing a divisionwide publication of these results for distribution in early 1990.

Company opens senior technical positions for its top engineers

During 31 years with General Dynamics, Gus Tricoles has contributed significantly to the field of electromagnetics. His 14 patents, published articles and technical skills have given him worldwide recognition.

However, as engineering manager-electromagnetics at Electronics Division, Tricoles found his endeavors limited by his management duties.

That changed for Tricoles when the company introduced its technical career ladder.

The program, instituted recently by several divisions, responds to the long-term career and professional development needs of key technical professionals who prefer to stay in their fields.

"This...should be a strong signal to our technical staff that they... are as important to our company's future as are our program and general management leaders."

-Ralph Hawes

"There had been a feeling among the technical specialists that to get to the top, one had to be in management," said Ralph Hawes, executive vice president-missiles and electronics. "This is a significant action and should be a strong signal to our technical staff that they and their contributions are as important to our company's future as are our program and general management leaders."

Five divisions — Convair, Electronics, Fort Worth, Pomona and Valley Systems — are using the program. Six employees have become senior technical staff members at Fort Worth, as has Tricoles at Electronics and Leo Kaszas at Convair. Pomona and Valley Systems are reviewing candidates for positions, while Space Systems is planning to use the program in 1990.

"In essence, we now have an expanded dual career ladder for engineers," said Jim Coleman, staff vice president-personnel relations, who said the company was responding to one of the issues raised in the 1986 Survey of Employees. "We have had senior engineering specialists and engineering staff specialist positions and now we've established a position that reports to the division VP of research and engineering at the same organization level as the senior engineering directors."

For which Tricoles is grateful.

"I felt I wasn't expressing myself as much as I

would have liked," said Tricoles, who was promoted to senior engineering staff specialist in mid-October. "I felt frustrated as a manager. Now I'm free to do more technical exploring."

Specialists are also freed to be mentors of younger colleagues, Hawes said.

According to William Shine, Electronics managerengineering personnel, Tricoles' promotion establishes an excellent role model. "With his background, he was a natural candidate for the new position," Shine said. "He is known throughout the world for his contributions in his field."

Fort Worth worked on its version of the program several years before it was actually formulated. Its six senior technical staff members were promoted during a surprise ceremony in June.

"We wanted a way to better recognize our top technical experts, our champions, who are truly world class in their field," said Dan Zimmer, division vice president-human resources at Fort Worth. "It gives them a real identity on the career ladder. There aren't many who qualify, though... they're the undisputed best."

The six are Gordon F. Gibson, configuration design; John E. Gulley, mechanical, fluid and pneumatic systems; H.Z. Scott, flight control systems; Raymond P. Peloubet, structural dynamics; Henry C. Lynn, electronic systems and avionics hardware and software; and Charles S. Liang, radar signatures.

"Something like this was needed for a long time," said Gibson, former manager of configuration development on the Advanced Tactical Fighter. "One of the things that bothered people in the technical end was that they didn't get the same opportunity as those going the managerial route. Now there is the extra rung on the ladder for them to climb." Gibson also said the new position may encourage others who want to pursue a strict technology role.

Peloubet, an engineering chief in charge of structural dynamics for 26 years, also said he felt as though he was at the peak of his professional progression.

"The new position was much appreciated," he said.
"It has relieved me of the administration end and allowed me to spend more time on the technical end."

Space Systems plans to use the program to increase flexibility in the promotion and recognition of its technical experts.

According to Hawes, the program adds another dimension to career paths within the company. "This is a further indication that we are a technically driven company," he said. "This is another method of demonstrating this to our employees as well as our customers."



Fort Worth employee Bill Murrell inspects the cockpit of All American, which has been restored to like-new condition

B-24 takes WW2-era workers back in time

HE COLLINGS FOUNDATION'S restored B-24 Liberator bomber, All American, brought back old memories for a few World War II-era employees still working at Fort Worth Division. The plane was recently displayed at the division while in town for an air show.

The aircraft was parked on the plant's flight line for three days, near the same runway where it made its first flight more than 45 years ago before delivery to the U.S. Army Air Forces. Consolidated Aircraft Corp., a predecessor of Convair Division, designed and built B-24s, which first flew 50 years ago this month. A total of 18,479 B-24s were built from 1939-44, including 3,034 at Fort Worth, then part of Consolidated.

All American is the only completely restored B-24 still flying. General Dynamics helped the Collings Foundation put the aircraft back into fighting trim for the first flight this summer of its second life.

"When I first saw it, it brought tears to my eyes," said one longtime employee, Bill Murrell, who works in the vibration test lab.

Murrell logged more than 100 hours of flight time in B-24s while adjusting bombsights and automatic pilot equipment in Liberators that had just rolled off the production line during World War II.

Weldon C. "Cowboy" Onken, a laboratory test mechanic, guessed that he may have worked on All American. He said he recognized the airplane as a Liberator by the sound of its engines when it arrived near the area where he works.

"I could have been blindfolded, and I'd have recognized that plane because I've heard so many of them," he said. Onken installed upholstery in B-24s near the end of the assembly line and was sometimes still working on them when they were rolled outside and the engines were cranked for the first flight.

Joe Stout

GD's financial reporting gets high marks

HE GENERAL DYNAMICS 1988 Annual Report has become the showcase of the aerospace industry, earning recognition from three different organizations.

The annual report recently helped capture the Award of Excellence from the Aerospace Subcommittee of the Financial Analysts Federation, given annually to the industry company judged by analysts to have the most effective financial reporting channels. Earlier, the report also received top honors from the National Association of Investors and *Financial World* magazine.

General Dynamics beat 10 other aerospace firms to win the Award of Excellence, which is given annually and weight-based on a company's annual report, quarterly reports and analyst relations.

In its assessment, the subcommittee said: "General Dynamics captured the top spot on the strength of its annual report and its analyst relations. The company earned the top spot in each of those categories."

The company shared the Award of Excellence in 1987 with Lockheed, which finished second this year. This marked the first time since 1983 that a single company received the award.

The annual report's second honor was the National Association of Investors' Nicholson Award for the "best

annual report from the individual investor's viewpoint." The annual award was given in the Aerospace/Diversified-Large Companies classification and was presented for financial summary, previous financial highlights, written content and design.

"The content of the report was effective and informative and easy to read...the cover was very attractive and the report flowed nicely," the association said.

The third award came from *Financial World* magazine for the best annual report in the aerospace industry. The magazine based its award on judging by more than 100 financial analysts, portfolio managers, research directors, academics and graphics experts.

Additionally, General Dynamics' investor relations program received high praise from *Institutional Investor* magazine for its "candor and ability to explain the company's strategy." The company's program was profiled among the 10 most outstanding ones in the country, based on a poll of analysts and portfolio managers. "They're quite open and frank: 'Here's our business. Here's what we've done,'" is how one analyst described the company's program to the publication. "That's all you can ask for, neither an oversell nor an undersell."

Annual Rate of Return for the 12 Month Period Ending: Oct. Oct. Oct. 1987 1988 1989 Salaried Government Bonds 5.5% 7.7% 9.1% Diversified Portfolio 7.6% 13.2% 29.5% Fixed Income 11.6% 10.8% 10.4% Hourly Government Bonds 5.7% 9.3% Diversified Portfolio 13.3% 30.3% Fixed Income 11.7% 10.7% 10.4%

\$50.00

\$53.50

\$52.50

GD Stock Closing Price

Savings and Stock Investment Plans

FAIARASAT



PALAACAEA



Scott W.
KINDNESS
Electric Boat



Dallas H.
DAECH
Land Systems



Dennis OVERTURFFort Worth



Douglas B.
NOYES
Valley Systems



James E.
MALLORY
Fort Worth



Robert G.
JACOT
Fort Worth



Robert H. KERR Convair



Chris
CASSELL
Space Systems



Sheryl L. BROWN Pomona

Photo (Continued from Page 1)

Starting with this issue of General Dynamics World, two of the winning 12 first-place photos — together with six runners-up — will be published in alternate months as part of a 1990 calendar. The January/February insert appears in this issue; the March/April calendar will appear in the February issue, etc.

Additionally, first-place winners will receive \$200 U.S. savings bonds; the 36 runners-up will receive \$100 bonds. All those who entered will receive certificates. Also-rans in this year's competition will get a second chance next year when the corporate communications department conducts the second annual GD photo contest. Stay tuned!



William H. FRITZ
Fort Worth



James A.
NUGENT
Space Systems



Michael UNDERWOOD Convair

Christmas clothing drive warms youths

OR THE SEVENTH YEAR, General Dynamics employees in the Detroit area turned their Christmas spirit into gifts that warmed the bodies of recipients and the hearts of givers.

Land Systems and General Dynamics Services Co. employees took part in Clothe-a-Child, a project at the Detroit Arsenal Tank Plant that uses donations to buy clothes for needy area youngsters.

School districts from surrounding communities selected the recipients. Accompanied by Land Systems and Services Co. employees, the children chose their new clothes at a nearby Sears Roebuck and Co. store.

The store opened early just for the children, and Sears employees volunteered their time to help the youngsters select their clothing. "You can't put a dollar value on the feeling you get helping a child, especially at this time of the year," said Sylvia Cichocki, one of several tank plant employees who accompanied the

children on their clothes-buying trip. "It just makes you feel good all over."

Added Pierlisia Scott, a tank plant accounts analyst: "The warmth you feel from helping these children stays with you for a long, long time. It's a feeling you don't want to go away."

After shopping, the youngsters returned to the tank plant in their new attire for a tour and Christmas party complete with entertainment by a clown and a magician. Canteen Corp., the vendor that services the plant cafeteria, donated food for the party. The party was topped by a visit from Santa, who distributed additional gifts to the children.

Since the inception of the Clothe-a-Child project at the Detroit Arsenal Tank Plant, General Dynamics employees have raised almost \$23,000 to provide new clothes for 181 children.

• Karl G. Oskojan

R U N N E R S — U P

* * * * * * * *	
Frank Arnone	Land Systems
Hans P. Bartz	Land Systems
Carole Black	Convair
Chris Bilewicz	Land Systems
Lance H. Carter	Space Systems
Marlene Carver	Corporate
	Headquarters/Athens
David A. Caudle	Space Systems
Sarah Garrett	Fort Worth
Michael Gruszczyski	Space Systems
Jeffrey S. Hanson	Electric Boat
Ken Hayes	Fort Worth
Mark A. Hoban	Fort Worth
Cary Johnson	Space Systems
Kevin Keierleber	Space Systems
Mai Quan Vinh	Space Systems
Ronald Maniewski	Land Systems
Ron Mathis	Pomona
Glenn O. Mortoro	Electric Boat
David Neel	Fort Worth
Mike Paris	Space Systems
Ed Passi	Space Systems
Craig Ranney	Valley Systems
Ronald F. Reutlinger	Electronics
Thomas Reynolds	Fort Worth
David Roth	Data Systems
George Scheib	Fort Worth
Stephen M. Slayton	Pomona
Ken Spencer	Fort Worth
Howard Spring	Freeman United Coal
	Mining Co.
James Stanish	Land Systems
Robert F. Trier	Electric Boat
G.W. "Pete" Vollenweider	Fort Worth
Art Weber	Land Systems
Charles A. White	GD Services Co.
Mary Jo Williams	Fort Worth
	T 10



The helping hands of James H. Cornell, a Land Systems contract representative at the Detroit Arsenal Tank Plant, make sure a shirt fits a youngster who selected it.

GDSC aids quadriplegic girl

Jan Zaloga Land Systems

General Dynamics Services Co. and Air Force personnel in Venezuela recently staged a run/walkathon to raise funds for surgery needed by Polett Villalta, a 14-year-old quadriplegic Venezuelan girl.

The Americans are assigned in Venezuela to assist the Venezuelan air force with support of its

"The support team members and their families solicited pledges for each mile they ran or walked," said Bob Hancock, program manager of Services Co.'s Venezuelan F-16 program. Pledges were received from other companies in Venezuela and from Services Co. employees in Fort Worth.

The effort raised \$10,000. Doctors say the girl has an excellent chance of recovery following the surgery.

Highway to heaven

ALERIE WILSON COULD NOT express her thanks to the two General Dynamics employees who flew a mission of mercy that returned her to her home in Waynesboro, Va. Wilson, 43, is comatose after suffering a stroke.

But thanks are not necessary, say Jerry Pohlen, corporate director-Washington operations-Cessna, and Paul Nus, corporate manager-U.S. military aircraft programs-Washington office. They are volunteer pilots with Mercy Medical Airlift, a non-profit organization that transports ill or elderly people who can't afford transportation, or whose condition is too

serious to travel by land transport or commercial airlines.

"You just feel really good when you've finished a mission," said Pohlen, who has flown seven since he joined the program in 1988.

Mercy Medical Airlift, based in Arlington, Va., is staffed by more than 120 volunteer pilots, nurses and administrators. The organization's operating expenses are funded through cash and in-kind donations from individuals, civic groups, foundations and corporations. General Dynamics is a corporate sponsor, and has donated maintenance equipment for the Cessna 421s that Mercy Medical Airlift uses as air ambulances. Each plane is outfitted to provide medical care, including life support for cardiac or pulmonary patients.

Pohlen learned about the organization from a newspaper article. He solicits

in-kind gifts and is a standby pilot four days per month. He told Nus about Mercy Medical Airlift a year ago. Nus has served as Pohlen's co-pilot on several missions.

Like all other pilots in the program, Pohlen and Nus have logged many hours of flight during their careers. Pohlen, a retired Air Force colonel, began Employee pilots give patients a lift

▼ A patient is helped to a Mercy Medical Airlift plane as Paul Nus (in blue sportcoat) and Jerry Pohlen (in white short-sleeved shirt) watch.



flying in 1948. He has flown 13,000 hours in various aircraft, including transports, helicopters and general aviation planes. He has worked at Cessna since 1958.

Nus learned to fly in a Cessna 150 when he was 15 years old. Later, he became a flight instructor pilot and gave private lessons in his spare time. He joined General Dynamics in 1979 as an aerodynamics engi-

neer at Fort Worth.

The pilots' experience, as well as that of the volunteer nurses, ensures the comfort and safety of the patient.

"Pilots get primary information on the patient and the nurse gets a lot more detailed information," Nus said. "The hospital staff tells us the conditions the patient has and any restrictions. For example, we know what altitudes the patient can go to, and then we can adjust cabin pressure to make it feel like we're very close to the ground."

Said Pohlen, "The day before the flight, we give our

flight plans to the Federal Aviation Administration, check our weather and register as a 'lifeguard' flight."

Nus added, "That classification means we'll get special handling as we talk to the approach controls and the centers that are part of the airspace system."

These steps made certain that all was clear for Wilson's flight. After four months in a Washington, D.C., hospital, Wilson was returning home to her husband, small son and the one-to-one care she needed.

Before her ambulance arrived at the Manassas, Va., airport, Pohlen and Nus pulled the Cessna 421 Golden Eagle out of its hangar for its final flight check. Faye Glace Trageser, an emergency room nurse and Mercy Medical Airlift volunteer, prepared the cabin. Wilson arrived, escorted by her sister. After

she was transferred to the plane, Pohlen and Nus prepared for takeoff.

Pohlen slowly piloted the plane from the hangar area to the runway. In a matter of minutes, the white and blue Cessna was airborne, fading into the cloudless sky—thanks to the volunteer spirit of Pohlen and Nus.

• Katherine Kelly

Pomona employees take ailing children to new heights

HRISTMAS CAME EARLY to a group of special children in Southern California last month when they had a chance to fly, some for the first time.

Two Pomona Division engineers, Steve Esh and Rick Paquette, joined 20 area pilots and nearly 150 other volunteers to support the annual Los Angeles area Eagle Flight, a program that provides free airplane rides to physically and mentally handicapped and terminally ill children.

This year, more than 400 children were given 20-minute flights over such land-marks as Disneyland, Knotts Berry Farm and Anaheim Stadium.

"I flew into a local airport a couple of months ago and saw the notice asking for Eagle Flight volunteers," Esh said. "I took it back and Rick and I decided to lend our support."

Paquette, a project engineer for the Standard Missile, flew his Cessna C-177 Cardinal. Esh, a senior electronics engineer, flew his Piper PA-28 Cherokee. They donated their flying time and use of their aircraft

"Each pilot flew about 10 sorties," Paquette said. "You could see and feel the excitement as the kids saw landmarks from a different perspective.

"That feeling spread to everyone. The pilots, ground

support people, parents and other workers...all enjoyed the day through the children's eyes."

Esh added, "The greatest thrill in flying is sharing it with others, and the Eagle Flight was one of the most



▲ Pomona engineer Rick Paquette in his Cessna C-177 Cardinal prepares to take Scotty Miller for a flight. Scotty's parents, Linda and John Miller, help him from his wheelchair into the aircraft. The Millers are from Yorba Linda, Calif.

rewarding ways to do it."

Paquette has been a private pilot for more than 18 years. He has more than 2,000 hours of experience, is instrument-rated and also flies a glider.

He says all his aircraft have been Cessnas. "My Cessna Cardinal was a great aircraft for this Eagle Flight program since it has a high wing, which makes loading easier and gives unobstructed visibility," he said.

Esh has been flying for just over three years, but he grew up around aircraft because his parents were pilots. He learned to fly through a local flying club that counts many division employees among its members.

"I had always dreamed of flying, but didn't think I had much of a chance until I came to GD and met other fliers through the aero club," he said. "I was in the Navy but didn't fly. I wish now I had because flying is such a great experience."

Esh is also a member of the civil air patrol and is training for emergency services.

Paquette said he and his fellow aircraft owner/pilots had no reservations about donating expensive flight time. "Our costs for the day were completely covered by the joy and excitement of sharing the special magic of our world, the skies, with these very special kids," he said.

The event is sponsored each year by the city of Fullerton, the Marine Corps and many Los Angeles area civic organizations and support groups.

■ Eric Solander



Getting Reacquainted. Two company executives and their wives who became fast friends in Southeast Asia during the Vietnam War met again recently by coincidence after not seeing each other for 18 years. They are Charlie B. Johnson and his wife, Gayle (left), and Charles D. Vollmer and his wife, Trish. Johnson and Vollmer were Air Force fighter pilots based at Korat air base in Thailand, flying combat missions over North Vietnam in 1971. Their wives became close friends while staying at Bangkok during their husbands' tour of duty. The couples later lost track of each other and did not know that both men had joined General Dynamics until they met by chance at the company's Third Quarter Performance Review in November. Johnson is Cessna's vice president-aircraft completion/product support, and Vollmer is staff vice president and head of the Defense Initiatives Office in Washington, D.C. "We're going to keep in touch now that we know where they're at," Vollmer said.

Role model honor to Barlow

Melville R. Barlow, corporate vice president and Electronics general manager, received the Mexican and American Foundation's 1989 Role Model Award in Science and Engineering recently in San Diego.

According to Tony Valencia, president and chief executive officer of the foundation, Barlow serves as a prominent example to all entrepreneurs with his successful career at General Dynamics.

The annual recognition honors individuals from diverse fields. Previous honorees include John McSweeny, Convair general manager.

Improved scholarship program set in 1990

The company will improve its college scholarship program in 1990 by introducing a new program administrator and increasing the amounts of individual awards.

Citizens' Scholarship Foundation of America will be the program's financial administrator. Three \$5,000 awards will be given to outstanding students who exhibit financial need. Two \$1,500 awards will go to outstanding students without regard to financial need. Awards to women and minorities will be given in proportion to the number of applicants. The previous maximum scholarship award had been \$3,000.

Eligible students must be children of General Dynamics employees and must be high school seniors who plan to major in engineering, physics, mathematics, chemistry, computer science or business at an accredited four-year college or university. All scholarships are renewable up to three years based on satisfactory academic performance.

Brochures and application forms will be available at all divisions and subsidiaries in December. Applications must be postmarked by Feb. 1 and sent to the Citizens' Scholarship Foundation of America.

General Dynamics will continue to support those students who have received grants through the previous administrator, the National Merit Scholarship Corp.

General Dynamics flashback

F-111 still going strong at age 25

Dec. 21 marks the 25th anniversary of the first flight and delivery of the Fort Worth-built F-111.

The aircraft took off for the first time four days before Christmas in 1964, making a happy and proud holiday for the thousands of employees who participated in its design and development after General Dynamics won the initial production contract in 1962.

The Air Force took immediate delivery of the initial A-model aircraft and began an extensive flight test program.

The F-111 established its place in aviation history as the first aircraft with a variable sweep wing and the first with a terrain-following radar for high-speed flight at low altitude.

Today, F-111s continue to play an important role in the inventories of the U.S. and Australian air forces. No other aircraft in operation or planning has the payload and range to perform the F-111's mission of low-level, all-weather, day or night deep interdiction.

The Air Force's continuing investment in midlife updates of the F-III's avionics and other systems is testimony that the aircraft is still a valued fleet asset.

The F-111 is one of the most tested aircraft in history, and the basic airframe's 10,000-hour service life indicates a fleet retirement date no earlier than the year 2010.

The F-111 was developed under the TFX program, a project of Defense Secretary Robert McNamara. The program was endorsed by President John F. Kennedy in a breakfast speech at a Fort Worth hotel on the day he was assassinated. The TFX was conceived as the first aircraft incorporating specific design features for performance in multiple roles. The most notable of these features is a wing that can be changed in flight. When fully extended, it allows short takeoffs and landings; when swept back, it allows supersonic flight at high or low altitudes.

The first F-111A eventually led to the delivery or creation by modification of eight different models of the aircraft. The F-111 has set numerous world records, including the longest low-level supersonic flight, 172 miles below 1,000-foot altitude, and the first tactical aircraft flight from the United States to Europe without refueling.

In 1986, an FB-111A crew made national news by transporting a donor heart cross-country at 700 mph for delivery to a transplant patient. The aircraft has also logged an impressive combat record, most recently in the 1986 raid against terrorist targets in Libya.

The last new-production F-111 was delivered from the Fort Worth factory in 1976, taking off simultaneously with the first F-16.

■ Joe Stout



A restored F-111A, the Phoenix III, dwarfs Fort Worth employee Dean Hudadoff.

F-111 'lawn ornament' plays important role

N F-111A REFURBISHED recently by Fort Worth's special programs department has become an impressive sight in Meridian, Texas. The plane is perched on a 40-foot tower atop a hill.

But the 74-foot, 12-ton aircraft wasn't taken to the agricultural area 65 miles from Fort Worth as a tourist attraction or landmark. It will be used in the first test program on the division's mile-long, ground reflection antenna range at Meridian.

The mechanized tower, designed to accommodate F-16s and F-111s, will allow the aircraft to be rotated for radio frequency tests, said Sam Clemons, Fort Worth's manager of EF-111A-related programs.

The rebuilt airplane shell, dubbed Phoenix III, was constructed from parts of more than 10 crashed or damaged F-111s. The project was completed in only nine weeks because of the dedication of a small team of division personnel.

"The majority of the airframe was assembled from parts remaining from the division's F-111 restoration program, which was completed recently after putting 13 aircraft back into active service," said Paul Hulett, project manager of the Phoenix III effort. "Some items, such as the right wing, nose radome and vertical stabilizer, were provided by the Air Force's Sacramento Air Logistics Center (at McClellan Air Force Base, Calif.). We reclaimed other parts that had been sent to

Arkansas for melting, and received some from the Air Force's boneyard at Davis-Monthan Air Force Base, Ariz."

The project was completed ahead of schedule and at a weight savings of 48 percent. The cooperation of the Sacramento Air Logistics Center and at least three departments at Fort Worth, the engineering, special programs, and modification and test organizations, made the early finish possible, Hulett said.

The aircraft will be used in antenna testing under an Air Force study contract awarded to Fort Worth in 1988. Fort Worth's antenna systems group will mount several antennas into the wing attachment area and measure them to see if they perform better than existing antennas on EF-IIIA aircraft. Other tests will evaluate radio frequency compatibility of the experimental antennas with existing systems, Clemons said.

"As aerodynamic structures become more critical for aircraft performance and radar cross-section applications, antenna integration is becoming increasingly more difficult," Clemons said. "The testing at Meridian is an important step in improving antenna integration techniques for future high performance aircraft."

Even though it won't fly again in the traditional sense, Phoenix III will still make a valuable contribution to the company and the nation's defense.

■ Joe Stout



A drawing shows the Combat Mobility Vehicle.

For new Army vehicles

Land Systems joins two teams

AND SYSTEMS RECENTLY formed teams with two firms, one British and one American, to compete for separate contracts that are a part of the Army's Heavy Forces Modernization program.

Land Systems and a British firm, Vickers Shipbuilding & Engineering Ltd., are teaming to compete for the Advanced Field Artillery System, a self-propelled gun. Land Systems also teamed with Caterpillar Inc. to compete to build the Combat Mobility Vehicle, an obstacle-clearing unit.

The self-propelled gun will replace the Army's aging M109 system that dates to the mid-1960s. The program calls for 3,500 artillery units with a potential value of \$7 billion.

Vickers is under contract for the British army's AS-90 system, a self-propelled howitzer.

"We see an upgrade of the self-propelled artillery system as fulfilling a real and continuing need and are pleased to complement General Dynamics' expertise with our AS-90 system experience," Vickers General Manager Walter Brown said. "We think allied technical relationships are a hallmark of the future for defense industries."

The Combat Mobility Vehicle is a fully armored combat support vehicle that includes a mine-clearing blade and powered excavator arm based on commer-

cially proven designs. It will give Army engineers the capability to breach mine fields and complex obstacles. The program could call for as many as 249 vehicles initially with a potential for more than 700 vehicles.

Caterpillar Inc. is the world's leader in developing and producing earth-moving and heavy equipment. Land Systems and Caterpillar have delivered more than 50,000 combat vehicles and a million earth-moving machines since starting operations.

"The combined resources and proven technical expertise of the General Dynamics and Caterpillar team will ensure that soldiers get the very best Combat Mobility Vehicle possible," said John Tschantz, Caterpillar's manager-defense products.

"We are fortunate to team with two of the most respected and technically proficient contractors in the world," said Michael W. Wynne, Land Systems vice president-business development. "The agreement with Vickers signals a long-term cooperative effort for work on land combat systems. Caterpillar's acknowledged expertise in heavy equipment meshes well with our manufacturing and combat vehicle systems integration experience. These two teams can meet the Army's need for both an improved self-propelled artillery unit and a new multipurpose support vehicle."

Jack Price

Atlas launch sales cross midpoint

PACE SYSTEMS DIVISION'S ATLAS program, projected for 60 launch vehicles, has passed the halfway mark in sales of launch services to commercial and military markets.

The company's Commercial Launch Services subsidiary announced Nov. 30 a firm order for two Atlas I launches of Galaxy communications satellites for Hughes Communications Inc., a subsidiary of Hughes Aircraft Co. The latest order brings the number of firm commitments to 32 — 22 from commercial sources and 10 from the Air Force. In addition, there are options for eight more commercial launches.

The 3,163-pound Galaxy satellites will be launched from Complex 36B at Cape Canaveral Air Force Station in Florida by a General Dynamics team that has launched 37 communications satellites. The first Galaxy will lift off in October 1991 and the second will launch in the first quarter of 1992.

The two Galaxy satellites will be built by Hughes Aircraft Co. They will be the first replacements in the six-satellite Galaxy/Westar fleet, owned and operated by Hughes Communications. The satellites will serve major cable television programmers, including Home Box Office, Entertainment and Sports Programming Network, Turner Broadcasting, Cinemax, Arts and Entertainment, and USA Network. The satellites feature high transmit power, improved internal redundancy and an extended lifetime.

Commercial Launch Services offers a complete launch service package, including spacecraft integration, launch operations, and placing the spacecraft into orbit. The Atlas family of launch vehicles can satisfy a major share of the commercial launch market through the 1990s.

There are four versions of the Atlas. The Atlas I is an improved version of the Atlas/Centaur. Atlas II builds on the Atlas I configuration to provide increased performance. Atlas IIA is similar to the Atlas II and offers an uprated propulsion system. Atlas IIAS is outfitted with four Castor IVA solid rocket motors and can place payloads up to 7,700 pounds into orbit.

New HQ for Space Systems

Space Systems Division broke ground Dec. 1 for a headquarters building at its Kearny Mesa facility in San Diego.

The 200,000-square-foot, four-story structure will occupy space now used for parking along Kearny Villa Road and will blend architecturally with the other buildings in the General Dynamics Kearny Mesa complex. The building is expected to house over 1,000 Space Systems employees in various administrative departments as well as the division's executive staff.

Downturn

(Continued from Page 1)

doesn't even approach some of the things that have happened to our industry—in terms of actual buying power—over the past four decades. As a matter of fact, our own internal defense environment studies have projected, as a lower boundary, cuts of this order—and I am still feeling comfortable with our prediction. In other words, it is not a doom-and-gloom situation for the entire defense industry.

"What we need to watch in the industry is the confluence of the budget constraint combined with the impact of arms reductions brought on by the dramatic turn of events in the Communist world. That could impact particular programs, as the Intermediate Nuclear Forces Treaty did with the removal of ground-launched cruise missiles in Europe.

PROGRAMS

"Total budgetary constraints will affect all the armed services. On the other hand, arms talks and reductions could affect discrete programs more than just budgetary constraints. A program under budgetary constraints could be stretched out whereas a program could be completely truncated at the treaty table. It is a confluence of both forces that need to be looked at. While I don't think that any of our programs are cancellation candidates, some could be stretched or reduced. For instance, it is unlikely that the Advanced Tactical Fighter would be offered up in arms talks; however, it could be stretched out. If the program development is significantly stretched, the Air Force would have the option to continue to buy today's F-15/F-16 mix at some level of production to fill in the gap.

"For almost all of our new-start programs we have fallback positions. For example, if the SSN 21 submarine doesn't come along as planned, we can continue to build the SSN 688 class. If the advanced tank doesn't come along as quickly as currently envisioned, we can continue to build versions of the M1 tank. In a similar fashion we can continue to build existing cruise missiles if a more advanced version isn't affordable — and so on. And while no one can foresee what quantities of these might be needed, we are at least prepared to continue production of versions of each of these critical programs.

DIVERSIFICATION

"We have no intent to change our major focus from defense. It's always nice to be in the 'other' business when a downturn comes along in your own; but it's equally nice to say every morning that there's a guaranteed marketplace out there in excess of \$250 billion. The only question is 'Am I in the right portion of the market?' Other marketplaces have their problems, too. What we all find ourselves doing, whether in the commercial or defense business, is managing change. Would I rather have a steadily increasing defense budget each year? Why, certainly. Are we in the wrong business? No. Are we in a downturn? Yes. Is it deep? No. Will we survive? Yes. Will we come out of it stronger? Yes.

"Also, while we're essentially a 'pure defense play' company, we already have some strong commercial elements to our base: Material Service, Cessna — with a great future — having turned the corner in its market, our Space Systems Division with more than 60% of its future booster business in commercial areas, and about one-third of Convair now in commercial aircraft, building the entire passenger fuselage of the MD-11.

"There's a real possibility that in the future — perhaps two to four years out — some mergers in our industry will occur. The business teaming arrangements we're witnessing today are really subtle mergers, in fact.

SUMMARY

"So we have a confluence of two forces at the moment: first, the budget downturn in which real numbers haven't yet emerged but which we don't believe are as bad as envisioned by some and, secondly, the rapidly changing geopolitical picture around the world. What and how much will be withdrawn from Europe? What will military strategies be in other parts of the world? I think answers to these questions will have more influence than the actual defense budget level.

"We're settling down to ride out the next year or two of turmoil. We're keeping our powder dry. We don't plan to make any dramatic investments or acquisitions. I think that by the end of this next industry cycle, General Dynamics will be one of not too many in the industry who will be healthy. We've looked very closely at our investments, we've been writing them off as we go, and by the end of 1990 we'll be in a position where our primary challenge will be to perform on existing contracts."

Joint company-union program trains toolmakers

ANY PEOPLE AT FORT WORTH were surprised when the company and machinists' union approved a federally sanctioned joint apprenticeship program in 1987.

Some factory managers and many members of the International Association of Machinists and Aerospace Workers were still skeptical when the first group of 16 apprentices entered the program in mid-1988.

Was it going to offer "real" training or just rubberstamp certification? Was it an unfair shortcut to the status that some journeyman toolmakers had worked more than 10 years to earn? And for the journeymen who would train apprentices, was it just going to mean extra work and responsibilities?

Now that the program is a little more than a year old, union and company officials who negotiated it generally agree it has been a success.

"The tooling trades apprenticeship program is one of the first company-union programs that we've had with equal input from both parties," said Rich Briggs, the production department's director of tooling and manufacturing engineering. "It's also a tough program that requires a big personal commitment from the apprentices and a program that seems to be working very well."

The program offers journeyman certification in seven tooling trades practiced at Fort Worth: toolmaker, form block maker, plastic toolmaker, plaster pattern maker, template maker, wind tunnel model builder or die finisher. The curriculum includes 8,000 hours of on-the-job training and nearly 600 hours of outside instruction in math, drafting and other technical courses offered by Tarrant County Junior College. Apprentices attend the outside courses on their own time.

Tooling consists of various devices used to form and hold aircraft components in production. The apprenticeship program was created to address a nationwide toolmaker shortage and the lack of formal instructional programs in the field.

"The company had approached the union about a training program in years past, but we never could agree on one," said toolmaker Jerry Weatherly, a member of the union negotiating team and chairman of the Joint Apprenticeship Committee. "In the 1987 contract negotiation, the company and union agreed on basic guidelines for an apprenticeship tooling program. It's pretty easy to negotiate when both parties want basically the same thing."

Mike Slimmer, supervisor of the apprentices, said they are evaluated for job performance throughout the four-year program and must make at least a C in outside courses. They also work in various areas outside their regular occupations during the program. Apprentices are rotated among all seven tooling departments and several other areas to better understand tooling, but spend the majority of their time in their classification.

Paul Gleaves, a journeyman form block maker with



Apprentices (from left) Becky Minton, John Ryan and Bill Lafrentz listen to journeyman toolmaker Don Ruhs.

more than 25 years' experience, has worked with at least six apprentices during their rotational assignments in his area. "I think it's a great deal," he said. "I only wish each apprentice could stay a little longer to get a better idea of how the department works."

Rotational assignments vary from 40 to more than 1,500 hours, depending on the area and the work classification being learned.

Larry Enriquez is one of 32 current apprentices. "I like the program because it brings your level of education up and we get to know about what the other departments are doing," he said.

Dwayne Skow started the program with the second group of apprentices in January. He is a graduate of machinist training at Texas State Technical Institute, but says his technical school background gave him

limited preparation for tooling work.

"I've learned a lot from going around to the different areas," he said. "But you have to dedicate some personal time to this program. I go to school on Tuesdays and Thursdays, so it keeps me pretty busy."

As Weatherly put it, the journeyman's certificate will be a "a golden key that will open doors for them."

Said Slimmer: "The real aim of the program is to maintain and improve the high quality of workmanship in the tooling trades. This is of mutual interest to both the company and the union."

Candidates for the apprenticeship program are considered by seniority in their classification. The program will open to other candidates in about two years after the seniority obligations have been fulfilled, Weatherly said.

Security departments striving to be leaders in TQM

OTAL QUALITY MANAGEMENT IS A relatively new companywide initiative. But its purpose — continuous improvement of products, services and activities — is not new to members of the company's security departments, who have spent the last few years taking actions throughout the corporation that fit under the philosophy's umbrella.

"What we've wanted to do is make the security function proactive instead of reactive," said Bill Ferrier, corporate director-security. "We've worked to put ideas into practice that anticipate events, rather than waiting to respond to potential emergencies.

"We shifted from a security 'system' to a security 'program.' The latter emphasizes the importance of the individual employee's knowledge, understanding, support and participation. Individual security awareness is up and the number of security-related incidents is down dramatically. These findings are quantified in the vastly improved Defense Investigative Service semiannual inspection results at each of our facilities.

"In addition, we've tried to find ways to help the company save money. Security isn't thought of as a revenue producer for General Dynamics, but we do help the company cut costs."

A prime example is the Corporatewide Automated Security System, which the corporate security department developed three years ago with the help of the Data Systems and Fort Worth divisions and the Defense Investigative Service. The system electronically tracks clearances, keys and classified equipment and documents and processes visit authorizations.

One of the system's benefits: Employees with clearances who transfer to another division have those clearances transferred and activated in two or three days. Before the system went into operation, reinstatement required about a month, during which time an employee could not perform classified work. A large division can save up to several million dollars during a normal year's clearance activity because cleared employees spend minimal time in a "holding pattern." Smaller divisions will save proportionally.

The system has proven so successful that it has been reviewed and adapted where applicable by other contractors and the Defense Investigative Service.

Two of security's other total quality management-related activities:

• Emergency contingency plans for overseas personnel. Employees working in historically unstable regions are prepared to cope with emergencies. This work had been done previously by consultants at great cost to General Dynamics. Personnel from different divisions/subsidiaries serving overseas

responded differently to emergencies. Now they develop procedures and respond to emergency instructions from an in-country team. Security departments also work with travel departments to identify air carriers likely to be terrorist targets.

 Annual symposiums. All of the company's security directors and managers meet to promote the flow of ideas and projects that can be used by any or all attendees.

At the last meeting, security managers found they were already applying total quality management to much of their work when they heard an address from Joe Frankovsky, vice president-total quality management. They left the meeting with a call from Ferrier to come up with more total quality-related ideas by mid-December that are applicable across the company.

"TQM will be a successful program throughout our security departments because of sound leadership, pride and esprit de corps," Ferrier said. "We want to be the leaders in making TQM work. It's not enough to simply do more with less. We will take a hard common-sense look at all of our work to further quantify security's continued significant contributions to the company. The best way to do this is through an effective TQM process."